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Opinion Review

Anesthetists for the Future

In the February 1952 issue of the JOURNAL we presented for discussion in this column the subject of the anesthetist for the future. The elements of the problem are the increasing shortage of trained anesthetists and the related necessity for additional inducements to get nurses to take up the specialty. One proposed inducement is the establishment of courses in anesthesia leading to a degree. A failure to step up the recruitment of student nurse anesthetists could be attended by a movement to make up the deficit with anesthesia technicians, who would fill the breach in anesthesia that the practical nurse has filled in nursing. Additional opinions from our readers about the relative merits of the present system of training nurses as anesthetists in hospital schools of anesthesia, the institution of degree programs, and the training of anesthesia technicians will be welcome.—Ed.

In my opinion, the only solution to the problem of the present shortage of trained anesthetists is to be found in increasing the number of training programs for nurse anesthetists and recruiting more nurses to the field. No fault can validly be found with the present system of training anesthetists in hospital schools of anesthesia. On the other hand, certain obvious criticisms can be made of the proposal to augment the supply of anesthetists with anesthesia technicians. Furthermore, I can see no possibility of a great increase in the number of anesthetists as a result of offering the incentive of courses in anesthesia leading to a degree in anesthesia.

While the existence of anesthesia technicians would not necessarily lower standards of anesthesia practice any more than the existence of the practical nurse has lowered the standards of training and practice in professional nursing, it would be difficult to determine the specific function of the technician. There is no such thing as *minor* anesthesia even though there are so-called minor operations. There are no functions in the administration of anesthesia comparable with the functions of the practical nurse in the care of subacutely ill or convalescent patients. The very minimum of education that the anesthesia

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technician would need to administer anesthesia safely would so closely approximate the educational requirements of the graduate nurse anesthetist that no measurable advantage would be obtained by trying to recruit anesthetists from the laity. On the other hand, the education and experience obtained in a school of nursing is invaluable to an anesthetist, since the administration of anesthesia calls for the highest quality of patient care, not merely technical facility.

Whether a nurse anesthetist wishes to work towards a degree in nursing is an individual matter. The anesthetist who wishes to teach would, however, find some of the courses invaluable. No university programs in nursing are specifically designed to offer the type of work needed by anesthetists. Moreover, any program leading to a degree in anesthesia would have to be based on the curriculums in the present hospital schools of anesthesia. Except in the case of the nurse who finds personal satisfaction in obtaining a degree, I can see no advantage in concentrating on degree programs in anesthesia when a wider purpose could be served by concentrating on improving the education of nurse anesthetists in the hospital schools of anesthesia. Emphasis on degree programs would only tend to increase the shortage of anesthetists; the higher the educational requirements, the fewer the persons who would be interested in entering the field. The time required would further deplete the supply.

The key to recruiting nurses to the specialty of anesthesia lies in capturing their interest before they make other plans. A good anesthetist is wholeheartedly interested in being an anesthetist and nothing else. We cannot expect schools of nursing to do our recruiting for us, and I doubt that very much is accomplished by supplying schools of nursing with material on anesthesia to be presented along with material on public health nursing and the other nursing specialties. The chief nurse anesthetist in the anesthesia department in hospitals that conduct schools of nursing might well ask for an opportunity to talk to the student nurses about anesthesia as a career. In addition, every student nurse who spends time in the operating room and obstetric department should be looked upon as a potential recruit. Many anesthetists obtained their incentive to enter the field of anesthesia by observing nurse anesthetists on the job.—**Exire O'Day, R.N.**, Ravenswood Hospital, Chicago.

In the February 1952 issue of the JOURNAL, I read with considerable interest the article "Anesthetists for the Future." I realize I am only a newly accepted member in a new field, and that I may not be in possession of many of the pertinent facts. However, here is my opinion.

Thinking along the lines of anesthesia technicians is not positive thinking; it is taking the easy way out. One does not improve the

quality of the group by accepting people who do not possess the necessary educational qualifications. How, may I ask, can anyone clearly and concisely outline the duties and functions of the anesthesia technicians? It would be indeed difficult. Before accepting anesthesia technicians it would be well to try everything else first.

Anesthesia as a specialty should be publicized to graduate nurses. Tell them about anesthesia in every way possible. We should adopt an active program of publicity by using posters, movies, personal visits to schools of nursing by A.A.N.A. members, pertinent literature, and, last but not least, radio and TV. We must awaken potential nurses to the possibilities and the advantages of the specialty of anesthesia.

It would be well to offer scholarships to worthy and interested graduating seniors in schools of nursing. An inducement of this sort would enable many to enter the specialty. Many potential students may feel that they must work for some time to earn the necessary funds before going into anesthesia. If they put off going into anesthesia, they may be lost entirely. For this very reason, perhaps, many nurses who otherwise would be nurse anesthetists are lost—because they lacked funds when they were most interested.

Faculty ratings on the basis of student evaluations would make instructors in schools of anesthesia conscious that the students are aware of a lack of instruction. *An instructor who does not stimulate the student to study will make anesthesia technicians of graduate nurses.* If a school of anesthesia wishes to keep abreast of modern educational trends, it should adopt certain devices used by leading colleges and universities, of which faculty rating is one. The popularity of a school of anesthesia is in direct relationship to the quality of its faculty.

I believe it would be well if the A.A.N.A. would assist in establishing postgraduate schools of anesthesia in large hospitals to offer refresher courses. This would stimulate graduate anesthetists to seek refresher courses and learn new technics. Also, many prospective nurse anesthetists would become interested when they realized the A.A.N.A. was making provisions for further study. The more opportunities the nurse anesthetist has to study, the more that nurse will be able to raise the standards of the entire profession. It is well to remember that the A.A.N.A. is made up of individuals, and even if only a few take advantage of postgraduate courses, the Association as a unit will be leavened.—**Philip Kromm, R.N.,** Moscow, Idaho.

[*The A.A.N.A. has already given consideration to certain of these suggestions in connection with its educational objectives. An intensive program for recruiting nurses to the specialty of anesthesia is also under way. However, we wish to commend Mr. Kromm for his enthusiastic interest in a problem that concerns all nurse anesthetists.—Ed.*]

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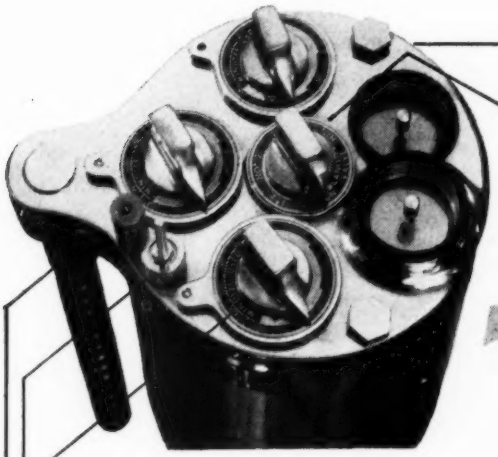

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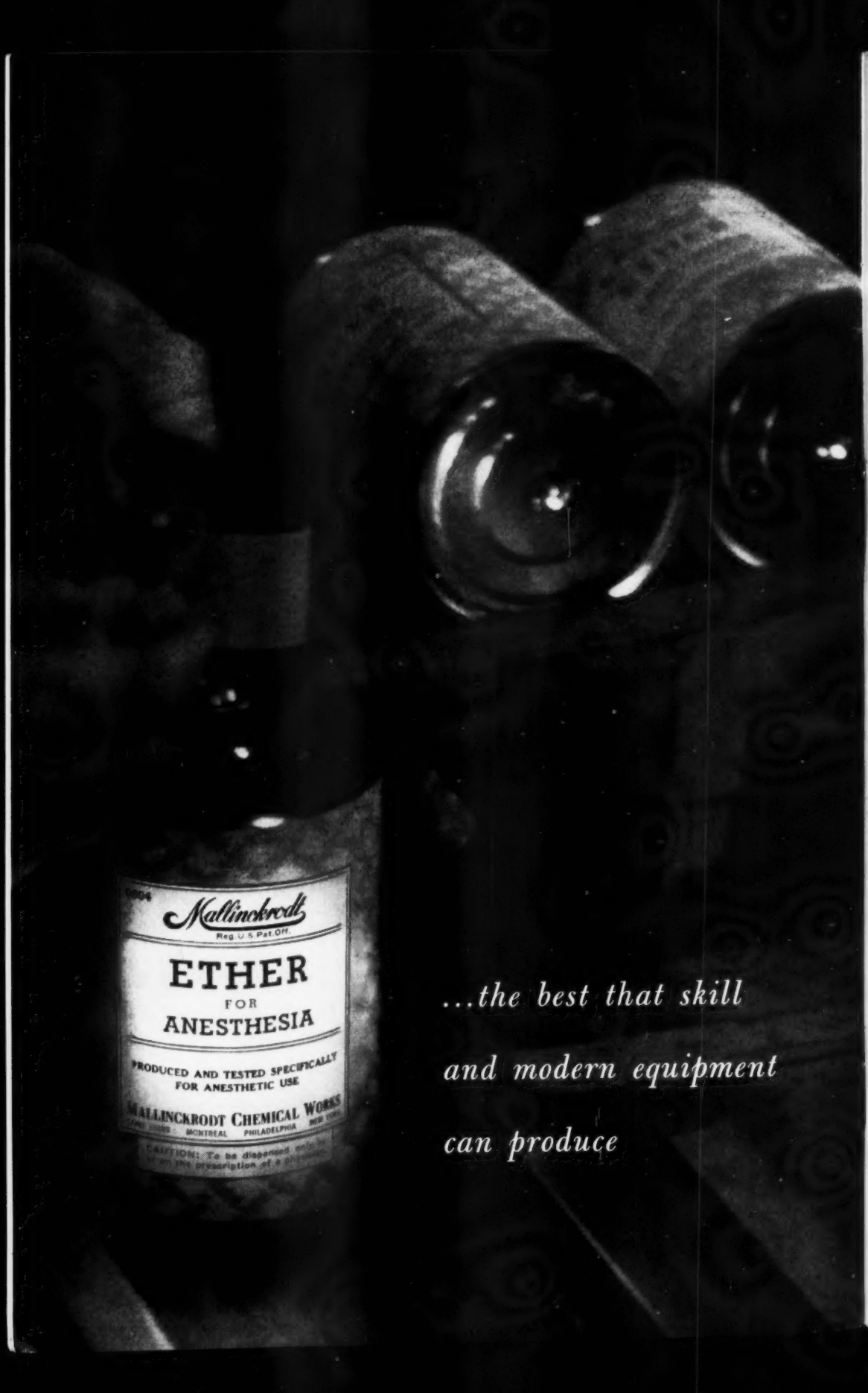
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A. A. N. A. Accreditation Program

On January 19, 1952, the trustees of the A.A.N.A. put their stamp of approval on a plan for the accreditation of schools of anesthesia for nurses. Just such a program was proposed over twenty years ago —shortly after the Association was organized in 1931.

Then as now it seemed that no other instrument could so effectively help those entrusted with the education of nurses in the specialty of anesthesia as a broad plan of service to the schools under a recognized accreditation program. Then as now the first principle was the preservation of human lives by setting realistic but high standards of training.

Since the first responsibility of a profession is continually to improve the quality of service that its members render individually and collectively to the public, the inauguration of the accreditation program is a memorable event in the history of the Association. The financial support of the members, which made it possible for the Association to act as the sole accrediting agency, and the years of hard work by the committees, to find a sensible method for effecting accreditation, reflect the nurse anesthetist's awareness of professional responsibility.

The specific aims of the accreditation program are several: (1) to stimulate improvement in education and to provide good standards of practice; (2) to give prospective students information about the quality of the schools; (3) to furnish counsel to the schools; and (4) to give recognition and protection to institutions of merit. These aims will be realized by continuous energetic endeavor on the part of those charged with the perpetuation of the program. But even more essential to the success of accreditation will be the acceptance of the idea by present and future members of the profession and by all others concerned with medical care. In this every A.A.N.A. member can be a forceful public relations agent.

Choice of Anesthesia for Surgical Hip Pinning in the Aged

A Report of 250 Cases

Mary A. Costello, R.N.,* Charlotte Turner, B.A., R.N.,†
Mary Hawkins, R.N.,‡ and Monica Glenn, R.N.‡
Cincinnati

Current medical literature evidences an increasing interest in the problem of surgical treatment of the aged. It necessarily follows that anesthesia management of these patients is an integral part of the picture. Intratrochanteric fracture of the femur is one of the commonest indications for surgical treatment of the aged, and in this article we shall discuss the problems that arise in the management of anesthesia and how we believe they are best met.

The following discussion is based on a series of 250 hip pinnings done at Cincinnati General Hospital in 1950 and 1951. The choice of method was about evenly divided between Neufeld and Smith-Petersen nailings. The age of the patients varied from 60 to 93 years. No deaths occurred either during operation or within the first three postoperative days.

Preoperative Preparation

Many physiologic changes normally accompany senescence, and there is often a discrepancy between the patient's physiologic and chronologic age. Some persons at age 80 are in better condition, both physically and mentally, than others at age 60. These factors must be considered in the approach to psychologic management, physical evaluation, premedication, and choice of anesthetic agent.

Psychologically speaking, a great number of the patients in this age group must be treated as children. They have had a shocking accident; they have been removed from the security and shelter of their homes and families to the strangeness of the hospital ward; they are in pain and frequently become disoriented and hysterical as a result of this experience. Patients of this type must often be restrained, which, although it is a necessary evil, adds to their distraction. When they are brought to the operating room, the anesthetist can do much to allay their fears by talking to them reassuringly and protecting their modesty as much as possible during the surgical preparation. Too often modesty is disregarded

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by operating room personnel when the patient is senile or disoriented, but its violation is contributory to excitement and distraction preoperatively.

On the other hand, should the patient be well preserved and completely oriented, kindness and understanding on the part of the anesthetist will go far towards maintaining his mental and physical welfare. Fright is a normal reaction to anesthesia and surgery, even in the young, and most patients of advanced age are certain that they will not survive the procedure. Therefore, a few minutes' time taken by the anesthetist to reassure these patients will be rewarded by ease of induction of anesthesia.

It is not uncommon to find many complicating pathologic conditions upon physical examination of aged patients. Those most frequently encountered are generalized arteriosclerosis, hypertensive cardiovascular disease, cardiac decompensation, auricular fibrillation, heart block, renal and hepatic impairment, emphysema, pneumonia, atelectasis, dehydration and fever, anemia, and emaciation. When these conditions are encountered, an attempt is made to treat them insofar as possible before operation. Obviously, this is not always feasible because of the time element involved. Consequently, the least toxic anesthetic agents must be employed. A precipitous decrease in blood pressure must be avoided, and deep anesthesia should not be used. Also, replacement of blood is necessary as it is lost and should not be deferred until the patient becomes hypotensive.

There are conflicting schools of thought on the subject of premedication for the geriatric patient. However, as is true of patients of all ages, the rules relating to general physical condition, age, sex, and weight should be followed. A few physicians believe that the senescent patient should not receive any premedication. Some favor a minimal dose of a barbiturate plus atropine sulfate. Others lean towards obtaining mild sedation and analgesia by the administration of a short-acting barbiturate an hour and a half before operation and one of the less toxic narcotics with atropine sulfate just prior to the time the patient is taken to the operating room. We adhere to the last view, the dosage being varied according to the condition of the patient. Of the narcotic drugs, our preference is for demerol, in doses of 25-50 mg., because of the fact that it produces maximal sedation and analgesia with minimal side effects, such as nausea, dizziness, respiratory depression, and hypotension. Nembutal or seconal, gr. ¾, or luminal sodium, gr. 2, are the barbiturates of choice. In some instances of extreme debility and cachexia, chloral hydrate, gr. 15, is substituted for the barbiturate. Atropine sulfate is given for the usual reasons of checking secretions of mucus and inhibiting vagal reflexes.

Choice of Anesthesia

One of the extrinsic factors that influence the choice of anesthesia for hip pinning is the explosion hazard. Since the roentgen apparatus must be used frequently throughout the procedure to determine the direction of the nail, explosions from electric sparks are an ever present danger. Unfortunately, many of the portable

roentgen machines that are used are old and not checked so thoroughly as they should be for proper grounding and wiring. Moreover, many operating rooms are not equipped with safety outlets for electric equipment, and there is no way to control humidity to help prevent static sparks. For these reasons anesthetic agents with a low explosive range are desirable. This would automatically eliminate ethylene, cyclopropane, and gas-oxygen-ether mixtures. Local, regional, and intravenous technics are therefore the methods of choice if the explosion hazard is going to be the determining factor in the choice of anesthesia. However, we have not been able to obtain satisfactory results with the use of infiltration anesthesia or intravenous agents alone. For the extremely poor risk patient local infiltration is obviously the only safe method that can be used. It has been our experience, however, that this is unsatisfactory for the surgeon, because of the fact that many of these patients are very unco-operative. Also, since the procedure usually lasts between two and three hours, and since the Bell table must be used, it is a painful ordeal for these old people to have to lie on a hard table with both legs in traction for such a long time. For these reasons local anesthesia is rarely ever used as the sole agent in this hospital.

Several years ago we, of necessity, used pentothal sodium intravenously plus nitrous oxide and oxygen in a 50-50 per cent proportion for all hip pinnings because it was the surgeon's choice at that time. Our results were not satisfactory for several reasons. Patients in this age group absorb and detoxicate very slowly barbiturates administered intravenously. Over a two or three hour period it was necessary to administer approximately 1.5 Gm. pentothal sodium to obtain adequate anesthesia for the procedure. If more than this amount was needed, we would switch to another inhalation agent. However, even with this limitation of dosage these old people would not respond well at the end of the procedure and frequently required the use of analeptic drugs to restore their reflexes. Then, when they were taken back to the ward, they would lapse back into sleep. With adequate nursing care this would not present much of a problem, but left undisturbed during the immediate postoperative period many of these patients would develop hypostatic pneumonia. Another complication of intravenous anesthesia was the incidence of hypotension during the procedure, which necessitated either excessive use of vasopressor drugs or intravenous administration of fluids. It is well know that elderly people, many of whom normally have hypertension and arteriosclerosis, cannot tolerate changes in blood pressure, such as those induced by the intravenous administration of barbiturates, without coincident shock during an operation. In this type of patient shock may prove irreversible, because of the sluggish response to the usual therapeutic measures. For these reasons we have concluded that intravenous anesthesia is not a good choice for the geriatric patient. In making an over-all choice of anesthesia and method we have selected the following technic as the one with which we have obtained satisfactory results.

If the patient has pulmonary disease or fever before operation, he is given a unilateral spinal nerve block. The drug of choice is procaine, approximately 100 mg. with epinephrine added. The spinal puncture is made while the patient lies on his affected side, and he is left in that position with several pillows under his head and shoulders to allow for fixation time and to prevent too high a level of anesthesia.

This technic has worked satisfactorily, but because of the patient's apprehension, difficulties in positioning, and painful stimuli we have reserved this method for patients not able to tolerate inhalation anesthesia.

Of the 250 patients in this series, 95 were given spinal anesthesia and the rest were anesthetized by the method we shall now describe.

If the patient arrives in the operating room with a severe decrease in blood pressure, or if he has respiratory depression after the administration of premedication, the intravenous administration of a barbiturate for induction of anesthesia is not carried out. If the patient's blood pressure is fairly stable, he is given small amounts of pentothal sodium to carry him past the excitement stage. This is given to him in bed before the traction is removed in order to eliminate discomfort and pain. Ether by the drop method is given slowly to prevent coughing and spasm, and the intravenous administration of pentothal sodium is continued to maintain a satisfactory level of anesthesia. Once the anesthesia is *maintained* in the first plane, the administration of pentothal sodium is discontinued, and the patient is moved to the table for reduction of the fracture and pinning. For the administration of ether a Yankauer mask with an oxygen adapter is used, and if this is not available, an oxygen tube is placed under the mask. An oxygen carrier, with a liter gage and humidifier permitting the insufflation of about 1 L. per minute, is preferred.

If we see the patient is requiring large amounts of ether to maintain stage III, plane one anesthesia, it is our practice to repeat the administration of small doses of demerol, usually 25 mg., half of which is given intravenously and half subcutaneously.

Supportive Therapy

The intravenous infusion of 5 per cent glucose in distilled water, through a large gage needle in an arm vein, is routinely started at the beginning of the procedure after induction of anesthesia. The flow is kept at a slow rate to avoid overloading the venous system. An attempt is made to replace blood as it is lost rather than wait until impending shock is manifest. In this series the average amount of blood required was 500 cc. Occasionally, the anemic or cachectic patient required more.

Should the patient's airway become obstructed or should he have poor tidal exchange, a pharyngeal airway is used, and if the condition persists, an intratracheal tube is inserted and the anesthesia maintained with oxygen and ether administered with the gas machine.

Hypotension and changes in pulse rate and volume are common in this type of patient regardless of the method of anesthesia. We confine the use of vasopressor drugs to the correction of hypo-

tension if the cause is known to be the premedication or the result of relaxation after induction of anesthesia. The choice of vasopressor depends on the patient's pulse rate. Ephedrine sulfate, 25 mg., is used if the pulse rate is slow. Methoxamine hydrochloride, 10 mg., is given intramuscularly when tachycardia occurs. These drugs are given intravenously only when there is a precipitous decrease in blood pressure.

One final precaution we feel is important: Care should be taken in moving the patient to the cart or bed, because sudden changes in position have been known to precipitate shock.

If in the immediate postoperative period the anesthetist notes any pronounced change in the patient's blood pressure, color, pulse, or respiration, the administration of oxygen by nasal catheter is started.

Conclusions

In conclusion, we would like to defend the stand we have taken in this discussion. First of all, it is generally conceded by surgeons and anesthetists that ether anesthesia, properly controlled, has the widest margin of safety, from the standpoint both of administration and of the patient's physiologic response. It may be thought by some that ether given by the open drop method to an adult is an outmoded technic, but from our viewpoint it has offered these advantages: There is less resistance to breathing in a patient whose vital capacity is reduced by age and debility; the difficulty encountered in obtaining a closed system with a face mask is obviated; the explosive range is lowered; dead space and the accumulation of carbon dioxide are reduced. In spite of the belief by some that the reduction of fractures and other orthopedic procedures necessitate deep planes of anesthesia, it is our feeling that for the aged patient stage III, plane one anesthesia is adequate to reduce reflex irritability enough to prevent traumatic shock.

Summary

This article presents a study of the choice of anesthesia for 250 hip pinnings, which were performed at Cincinnati General Hospital in 1950 and 1951, with no mortality either during operation or within the first three postoperative days. The patients were in the age group of 60 to 93 years.

Surital Sodium Anesthesia for Gastroscopy

John S. Atwater, M.D.*
Atlanta

Anesthetists are daily handling and giving drugs unheard of not many years ago. Yet they are giving them precisely and safely. By virtue of the use of these anesthetic agents, procedures in medicine and surgery little dreamed of in the past are being made possible. It is some of these anesthetic agents and their use in the endoscopic procedure of gastroscopy that I wish to discuss in this article.

Flexible Gastroscope

Until recent years gastroscopy was not used widely in this country, and there were very few men who were well trained in the use of the gastroscope. However, in 1934 Walter Palmer of Chicago invited to this country a German physician, Rudolf Schindler.[1,2] Two years prior to this, Schindler had perfected the first of the flexible gastroscopes, and because of this fact and his great interest in the field of gastroscopy he has been called by some the father of modern gastroscopy. Prior to the arrival of Schindler in this country, gastroscopy in the United States and in most of the world was performed by use of a rigid instrument, that is, one in which there was no flexibility, usually a tube open at both ends, much like an esophagoscope. There were many objections to the rigid gastroscope, and early progress in gastroscopy was slow because of some of the serious accidents that occurred in the course of this diagnostic procedure. Schindler's flexible instrument not only would bend but also contained an enclosed system of lenses, which permitted the observer to see parts of the stomach previously unvisualized or poorly visualized except under unusual circumstances. Also by virtue of the lens system and illumination there was less distortion of color and shadows. The so-called blind areas were reduced to a minimum. The first gastroscopic observations in the United States were published by E. B. Benedict[3,4] of Boston, and in 1948 at the Atlantic City meeting of the American Gastroenterological Association, he demonstrated his operating gastroscope.

Before the development of the

Read before the Annual Meeting of the Georgia Association of Nurse Anesthetists, Atlanta, Feb. 5, 1951.

*From the offices of Drs. Davison, Arp, Atwater, and Peacock.

1. Schindler, R.: *Gastroscopy; the Endoscopic Study of Gastric Pathology* (Chicago: University of Chicago Press, 1937).
2. Schindler, R.: *Gastritis* (New York: Grune and Stratton, 1947).
3. Benedict, E. B.: An operating gastroscope. Gastroenterology **2**:281, 1948.
4. Benedict, E. B.: *Endoscopy* (Baltimore: Williams and Wilkins Co., 1951).

flexible gastroscope there was no instrument with which to obtain stomach tissue for biopsy. The flexible gastroscope, like its ancestors, could be passed into the stomach for purposes of visualization, and, in addition, it had a separate channel, through which a long biopsy forceps or an aspirating tube could be passed. With the use of such an instrument not only could the lesion—ulcer, tumor, or gastritis—be seen, but also tissue of its edges could be obtained for biopsy. Gastric juices could also be withdrawn easily for Papanicolaou or cytologic study.

Local Anesthesia for Gastroscopy

In most patients the introduction of the gastroscope could be performed only rarely without first abolishing the gag reflex and allaying nervous apprehension. Preoperative medication, such as codeine, is usually given simultaneously with atropine sulfate by hypodermic injection thirty to forty-five minutes before the examination. Atropine sulfate is given in an attempt to reduce gastric and salivary secretions. Shortly before the examination a local anesthetic agent, such as a freshly prepared solution of cocaine or pontocaine, is used. This is gargled, sprayed, and swabbed over the oropharyngeal tissue. With special curved forceps the pyriform sinuses can also be anesthetized by the use of pledgets saturated with the anesthetizing agent.

A perforated tube approximately 8 inches long is passed until only the metal tip remains at the teeth. Through this tube the anesthetizing solution can be sprayed over the mucous membranes from the tongue downward to the hypopharynx and possibly upper esophagus. From 2 to 5 cc. of the anesthetic agent is usually sufficient.

When the gag reflex has been abolished, the stomach is emptied. Usually, an Ewald type of stomach tube evacuator is passed in the usual manner into the stomach. The patient's head is then lowered below the level of the stomach, and the gastric juices and contents are evacuated by gravity. After returning the patient to the horizontal position, he is laid on his left side, and the left elbow is placed under the left side of his thorax. The head is held by an assistant, and the gastroscope is introduced. Observation of the gastric interior then takes place.

While the procedure that I have just described is often adequate, it has certain distinct disadvantages. The examination is unpleasant to most patients despite efforts to prepare them psychologically. A medical student told me that in undergoing this procedure in the hands of another gastroscopist he felt as though he were being held on the examining table by a rod thrust from his mouth into his stomach and abdomen. An excitable patient minds this even more than a relatively stable young medical student. Unless the patient is most co-operative, he tends to gag and to move about on the table, which limits the time for good gastroscopic observation. From a teaching standpoint, the time allowed the examiner to show the students what he is looking at and to describe it and for the students, in turn, to identify the structure in question is exceed-

ingly limited. Yet many leading gastroscopists are extremely adverse to anything but a local anesthetic agent applied to the throat in gastroscopy. In my opinion, this attitude may well be conditioned by the fact that in the early days the proponents of gastroscopy wished it to be considered a routine office procedure. Of course, there is much to be said for such an attitude.

General Anesthesia for Gastroscopy

In 1947 I began to use general anesthesia for selected patients and to compare the results with those in a group of controls who received local anesthesia. The patients having general anesthesia for gastroscopy viewed the examination as entirely satisfactory. Many of those on whom local agents were used expressed hope that this would be their last gastroscopy. In all fairness I think it should be stated that the technic used in passing the instrument is not necessarily inadept or clumsy. Many of my colleagues experienced in gastroscopy have heard similar expressions from patients regarding gastroscopy under local anesthesia.

I continued to perform gastroscopy on selected patients under general anesthesia, but not without fear of criticism from the older gastroscopists. In 1948 Stempien and Greene[5] reported on a group of five patients to whom pentothal sodium and curare had been successfully given for gastroscopy. Apparently, others were thinking along the same lines as my associates and I.[6] In the April 1950 issue of the *Bulletin of the American Gastroscopic Society* the report of a survey of preoperative methods used in the preparation for gastroscopy was published.[7] In that report it was noted that eight physicians were giving pentothal sodium intravenously in a few cases. It was also stated that the consensus was that general anesthesia of this type was highly unsatisfactory. Two physicians reported the use of curare occasionally. Sexton,[7] who was editor of this bulletin and a recognized gastroscopist, stated that sodium amytal administered intravenously was superior to any other method he had used. It is interesting to note that the use of this method by Sexton came about while he was performing gastroscopy on patients at the St. Elizabeth Mental Hospital in Washington, D. C., where an effective but easily administered and easily controlled anesthetic agent was desirable.

In early examinations under general anesthesia I used pentothal sodium, which proved satisfactory. However, upon the introduction of surital sodium I tried this agent and found that the recovery period was so much more rapid that at the present time I am using surital sodium exclusively.

With the use of surital sodium and curare intravenously and oxygen intranasally my associates and I have performed successfully well over one hundred gastroscopies in the past two

5. Stempien, S. J., and Greene, W. W.: Gastroscopy under pentothal-curare anesthesia. Gastroenterology **10**:978, 1948.

6. Atwater, J. S.: The gastroscope as a diagnostic aid in gastric disorders. J.M.A. Georgia **39**:359-361, Sept. 1950.

7. Sexton, R. L.: A survey of the preoperative methods used for preparation in gastroscopy. Bull. Am. Gastroscopic Soc. **2**:4, April 1950.

years. In only one instance did we have a failure. This occurred in a nurse who had a congenital deformity of the cervical spine, which made it impossible for the gastroscope to be passed far enough to observe the stomach. The first attempt was made with the patient under local anesthesia. A second attempt was made with the patient under pentothal sodium-curare-oxygen anesthesia.

In this series there were no postoperative complications. As a rule, the patient could be awakened before he left the operating room or with few exceptions soon after reaching his own room. Eating and early ambulation were encouraged. Usually, the patient could be discharged from the hospital the same day he was admitted, which kept expenses and the need for a hospital bed to a minimum. The only after-effects observed were the usual throat and substernal soreness, which may accompany gastroscopy regardless of whether local or general anesthetic agents are used. Pontocaine sensitivity was observed in one instance only. It occurred soon after the oropharyngeal spray had been completed, and the patient responded to the intravenous administration of pentothal sodium. Cocaine sensitivity was not observed in this series. In two cases respiratory arrest of fairly severe degree was observed. In both instances the anesthesia was being administered in a strange hospital by an anesthetist who had had little experience with the use of curare.

From the gastroscopist's standpoint this technic for gastroscopy is ideal, in that time is not a factor. The examination can be conducted in an unhurried fashion. There is no longer the need to take transient glances at important areas because of some discomfort to the patient or the changing local picture. Lesions can be identified for multiple observers; hence, this method is excellent for teaching purposes. In my experience curare in the dosage that I ordinarily give for gastroscopy does not interfere with the motility of the stomach. Palpation of the abdomen, together with manipulation of the instrument, enables the examiner to see the prepyloric area, particularly along the lesser curvature, in a far greater number of cases when general anesthesia is used than when local anesthesia is used alone. When desirable the patient's position can be changed to the prone or to the right lateral position for additional views of the interior of the stomach.

The taking of tissue for biopsy by using the Benedict flexible operating gastroscope is not necessarily difficult, but anyone who has performed such a procedure realizes that it is tedious and at times quite trying. In the patient anesthetized locally the taking of the specimen for biopsy may prolong the examination and add greatly to the unpleasantness for the patient. With the use of intravenous anesthesia the examination may still be prolonged, but the unpleasantness is gone, and, of course, multiple specimens for biopsy may be taken with no additional risk or discomfort to the patient.

Technic of Anesthesia

The following technic is used for administration of the anesthetic agent.

The preoperative medication

consisting of demerol (75-100 mg.) and atropine sulfate (gr. 1/100-1/150) is given by hypodermic injection one hour before operation. The nasopharynx, throat, and epiglottis are sprayed with a solution of freshly prepared cocaine (10 per cent) or pontocaine (2 per cent) ten to fifteen minutes prior to the intravenous administration of the anesthetic. The ease of insertion of the gastroscope is enhanced if the throat and cough reflexes are abolished.

The patient is placed on the left side in the recumbent position with the right arm extended on an armboard, to which a syringe holder has been attached. In order to have free movement of the elbow should the gastroscopist wish to change the position of the patient during the examination, the vein selected for the intravenous injection is preferably on the outer arm or back of the hand.

A 2½ per cent solution of surital sodium is given slowly until the patient loses consciousness. A pause of a few seconds is observed to be certain that there is no respiratory depression. Then 60 to 80 units of *d*-tubocurarine chloride is given through the same intravenous tubing. A two-way stopcock may be used also.

A catheter is inserted through the nose as far as the oropharynx, through which 4 L. of oxygen per minute is administered.

The dose of *d*-tubocurarine chloride is determined by the size and stature of the patient. A short obese person will probably tolerate less surital sodium than a tall thin person. Additional surital sodium is given intermittently to keep the plane of anesthesia sufficiently deep. If necessary, 20 additional units of *d*-tubocurarine chloride may be given to insure good relaxation. Occasionally, hiccoughs occur and are controlled by deepening the plane of anesthesia.

Summary

A method of gastroscopy utilizing intravenous anesthesia (surital sodium) and curare has been presented. It affords an excellent approach to gastroscopy in selected patients, but it is not deemed necessary in routine gastroscopic examinations. By the use of such a technic the gastroscopic procedure can be conducted in an unhurried fashion. No longer is there any need to take transient glances at important areas because of discomfort to the patient or the changing local picture. From a teaching standpoint it is ideal, since lesions can be identified to multiple observers. The unpleasantness that may be associated with a prolonged examination when gastric tissue is taken for biopsy is no longer present, and multiple specimens for biopsy may be removed with no additional risk or discomfort to the patient.

Appreciation is expressed to Billie Caraway, R. N., who has contributed immeasurably to the success of this study.

Regional Block Anesthesia in Obstetrics

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The most important consideration in the development of any branch of medicine is reduction of morbidity and mortality rates. This is doubly true in obstetrics, since each case really represents two patients, the mother and the child. Pain relief has always been and will continue to be one of the most studied problems in obstetrics, for the perfect type of anesthesia for obstetrics has yet to be found.

The prerequisites for obstetric anesthesia are the same as those for surgical anesthesia, plus the factor of the safety of the unborn child. The older types of anesthesia — twilight sleep, Gwathmey's synergistic anesthesia, and chloroform, for instance — left much to be desired with respect to safety for the child. Later refinements with safer drugs, such as the barbiturates instead of morphine and the newer gases instead of chloroform and ether, were a big advance, but the margin of safety was still too small for complete peace of mind on the part of the accoucheur and the anesthetist. Another big fault with all these drugs is that the pain relief is obtained only by interference with consciousness, either partial or complete, and they actually often do not afford true pain relief but only subsequent amnesia, which was formerly considered desirable. More and more, however, it is realized that the expectant mother should be aware of the proceedings of childbirth, and that this wonderful experience should be enjoyed at the time and in person rather than by later revelation. During my early experience in delivering babies it distressed me to see labors handled with what was considered good sedation and anesthesia, so good in fact that it was often several hours before the mother even knew she had a baby, and it was always an appreciable time before she recovered visual faculties adequate to see what her child looked like. One case I particularly remember was thought to have been handled expertly because the patient awoke two hours after delivery, called for the nurse, and reported that she thought her water had "broken." The deprivation of the mother of the joy of giving birth through the use of narcosis can no longer be considered expert care.

The biggest advance in obstetrics in the past hundred years was the advent of continuous caudal

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analgesia for labor and delivery. The word "analgesia" instead of "anesthesia" implies one of the principal advantages of this method. The goal sought all along was pain relief, and continuous caudal analgesia was a means of obtaining it without interfering with the consciousness of the patient. Even more important, this method was the first that completely spared the child from exposure to the pain-relieving agent. The mother is completely conscious during labor and delivery and completely comfortable, and the baby has no narcosis whatsoever.

An additional advantage of continuous caudal analgesia is the relaxation of the muscles of the cervix and perineum obtained. If the administration is started at the right time, the complete dilatation of the cervix after the block is established is often dramatic. Also, blood loss at the time of delivery is small, for uterine tone is increased with caudal block analgesia.

Contraindications

However, continuous caudal analgesia is still no panacea, for there are some definite contraindications to its use, among them disease of the central nervous system, severe anemia, severe hypotension, placenta praevia, and lack of skilled attendants. There are other relative contraindications, such as emotional instability, precipitate labor, and bones so constructed that it is physically impossible to introduce a needle into the caudal canal.

Complications

Although I have emphasized the safety of the method, this depends on a proper technic of administration and careful observation. It is essential that the blood pressure be watched carefully. A decrease in blood pressure is likely to occur, although it is seldom severe and is easily controlled by the prophylactic or therapeutic use of ephedrine, intramuscularly or intravenously. In many cases the blood pressure may be restored to normal simply by elevation of the feet and legs. The decrease in blood pressure is due to dilatation of peripheral blood vessels, and elevation of the legs amounts to autotransfusion. The vascular dilatation is clearly evidenced by the pronounced increase in the temperature of the feet. A patient may think the physician very clever when, by feeling her feet after a caudal injection and finding one hot and one cold, he tells her that she will feel her next contraction on the cold side only. When the patient is moved, especially when she is turned onto her back, the blood pressure must be observed closely. Oxygen is a valuable adjunct in treating a decrease in blood pressure, and occasionally it will be necessary to resort to the intravenous administration of fluids.

It is important that the level of anesthesia obtained be noted as the block is being established. Although caudal analgesia is self limiting to the extent that the agent cannot reach the medulla, it is well to remember the admonition, frequently given by Hingson, "to stop the level of anesthesia short of the halo."

It is also important to watch for distention of the bladder, as the patient will not be aware of this condition while the block is in effect. The bladder can often be emptied by external pressure

during a uterine contraction without resorting to catheterization.

Specific Indications

Usually the choice of caudal analgesia is an arbitrary one as a means of pain relief. However, in the presence of preeclampsia or eclampsia, its effectiveness embraces control of hypertension as well as control of pain. It is by far the most effective means of controlling hypertension in the presence of toxemia. Its usefulness also extends to other hypertensive crises, such as those attending acute or chronic nephritis and essential hypertension, particularly when associated with oliguria or anuria.

Continuous caudal analgesia is excellent for cesarean section and other pelvic operations as well as for operations on the perineum, rectum, and lower extremities. In ureteral colic it is useful both for the relief of pain and in dilating the ureter to facilitate passage of a calculus. A single injection or repeated injections are efficacious in the treatment of thrombophlebitis and phlebothrombosis in the lower extremities.

Continuous Low Spinal Anesthesia and Saddle Block Anesthesia

What place do continuous low spinal anesthesia and saddle block anesthesia have in the armamentarium of the obstetrician? As far as I am concerned, these methods are second and third to caudal analgesia. The indications and contraindications are the same as those for caudal analgesia with the advantage that there are fewer patients who cannot be given a spinal injection. The decrease in blood pressure attending spinal anesthesia is likely to be more pronounced than that attending caudal analgesia. For this reason I much prefer continuous low spinal anesthesia to single injection saddle block anesthesia, for in the rare emergency the situation can be promptly controlled by the aspiration of 6 cc. spinal fluid or more through the needle already in place to quickly and almost completely remove the anesthetic agent. Blood pressure in the hypertensive patient cannot be controlled as safely with spinal anesthesia as with caudal analgesia, and spinal anesthesia, as least in my experience, cannot be maintained effectively for as long as caudal analgesia. I have never seen spinal anesthesia maintained with complete success for more than four hours, but I have successfully maintained caudal analgesia for as long as twenty-four hours. The only real advantages to the spinal route of administration are the ease of administration and the appreciably shorter time required to give the injection and achieve the effect.

Natural Childbirth

Any discussion of pain control in childbirth would be incomplete without mentioning the Grantley Dick Read method of natural childbirth. This is a worthy method, and with proper education many patients would be amenable to it. Actually, an appreciable number of sturdy women experience natural childbirth without fear, without particular pain, and without education. Obviously, where applicable, it leaves nothing to be desired. Unfortunately, however, there are many women who cannot reach the degree of relaxation required even

with education. Of my last 1,133 obstetric patients, 54 required no help, and only a few of these had ever heard of the Read method. In this group 291 patients had continuous caudal analgesia, 364 had continuous low spinal anesthesia, and 356 had general anesthesia. Supplemental general anesthesia was administered in almost exactly the same percentage of cases of caudal analgesia as of cases of spinal anesthesia, 30 cases of caudal analgesia and 38 cases of spinal anesthesia being included. Most of those in which supplemental general anesthesia was required were only partial failures, and a few were complete failures. In a small group the block was perfect, but the patient was apprehensive enough to ask for a few whiffs of gas during actual delivery.

SUMMARY

Regional nerve block anesthesia in obstetrics is discussed with particular reference to continuous caudal analgesia. The indications, contraindications, advantages, and disadvantages are given, and the relative merits of caudal analgesia and low spinal nerve blocks are compared. The discussion is based on results obtained in a series of 1,133 cases, in which continuous caudal analgesia was used in 291 cases, continuous low spinal anesthesia in 364, general anesthesia in 356, and no anesthesia in 54. In addition to these there were 30 cases of continuous caudal analgesia and 38 cases of continuous spinal anesthesia in which supplemental general anesthesia was required for complete pain relief or for a psychologic escape from the knowledge of the actual delivery.

Tracheobronchial Aspiration

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Removal of accumulated secretions from the tracheobronchial tree has become standard practice during anesthesia and throughout the postoperative period up to a point at which a good cough reflex is re-established. Attention to this detail by the anesthetist has been responsible in large part for the lowered incidence of serious postoperative pulmonary complications.

Stagnant bronchial secretions quickly become thick and tenacious enough to plug the smaller bronchi, and this causes massive or segmental atelectasis and pneumonitis. By interfering with oxygenation excessive accumulation of secretions may actually cause a patient to drown in his own secretions.

Because of the importance of bronchial secretions to the anesthetist, an understanding of their function, production, and physiologic removal is essential.

Bronchial Secretions

The tracheobronchial tree is bathed continuously by secretions from the goblet cells in the mucous membrane and from the tuboalveolar glands in the muscular layer of the tracheal and bronchial walls. The thick and adhesive mucin secretion of the goblet cells is separated from the mucous membrane by a thinner, serous layer of fluid secreted by the tuboalveolar glands. Thus a two layer blanket is formed with the more adhesive layer facing the bronchial lumen, while the thinner layer is in contact with the mucous membrane. The blanket adheres tightly enough to the membrane to prevent occlusion of the bronchial lumen and yet is fluid enough to be moved in an oral direction. This cleansing mucus blanket is in constant motion towards the larynx as foreign substances, cell detritus, exudates, and bacteria are caught up in it.

Goblet cells are spaced irregularly in the mucous membrane between the ciliated columnar cells. These goblet cells are found throughout the tree as far peripherally as the respiratory bronchioles. Tuboalveolar glands of serous and mucoserous type are located just under the muscular layer and are present as far distally as the bronchioles of 1 mm. diameter. Bronchial secretion is more viscid in the smaller and peripheral bronchi because it becomes diluted by the more serous secretion as it is moved orally.

In the presence of chronic irritation, inflammation, allergy, and dehydration, there is increased

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mucin production by the bronchial glands and goblet cells. This increases the viscosity and adhesiveness of the covering layer. In the presence of upper respiratory tract infections, chronic bronchitis, and bronchiectasis, a transudate together with exudate from the bronchial mucosal capillaries is added.

Ciliary Action

The fluid blanket is moved continuously in a central direction from the smallest bronchioles to the larynx by ciliary action, bronchial peristalsis, inspiratory and expiratory changes in bronchial diameter and length, and by cough. There is constant motion in the system.

Uninterrupted movement of the fluid blanket is provided by ciliary action. A ciliated pseudostratified columnar epithelium on a basement membrane is present as far peripherally as the respiratory bronchioles; here, the epithelium changes to low cuboidal. The cilia are extremely efficient in propelling mucus and foreign material. Motion of the cilia is wavelike, and the action is described as having the appearance of undulations seen in wind-swept grain in a field. Each individual cilium moves orally with a whiplike motion and then returns slowly to its original position. The rate of ciliary transport is estimated at 0.3 mm. per second. The cilia move in the underlying layer of lower viscosity with only the tips protruding into the overlying tenacious strands of mucin. With excess of mucin, cilia become entangled and their efficiency is reduced.

Ciliary action is most important in cleansing the smaller bronchi and bronchioles. The constant wavelike motion of the cilia keeps small bronchi free from foreign particles and bacteria. As particles and mucus aggregations increase in size and become heavier in the larger bronchi, ciliary action becomes less effective, and peristalsis comes into play.

Certain general anesthetics and many sedatives decrease or depress ciliary activity. Since the effectiveness of cilia is influenced by the viscosity and stickiness of the material in contact with them, anesthetics and drugs that cause drying in the respiratory tract reduce ciliary efficiency. Metaplasia of ciliated columnar epithelium to nonciliated squamous epithelium may take place in allergy and chronic bronchial infections.

Peristalsis and Contour Changes

In addition to the ciliary movements there are grosser movements in the bronchial tubes that are required for the elimination of larger particles and heavier accumulations of mucus from the tubes of greater diameter. It is an error to conceive of the tracheobronchial tree as a rigid system of motionless tubes encased in cartilagenous rings. Chevalier Jackson[1] spoke of the tracheobronchial tree as a "living, moving, labyrinth of resilient tubes enlarging in lumen, changing in contour and elongating on inspiration; diminishing in lumen and length, changing in contour and swaying on expiration."

An appreciation of the anatomic divisions of the bronchial system

1. Jackson, C., and Jackson, C. L.: *Bronchoesophagology* (Philadelphia: W. B. Saunders Co., 1950).

is essential to an understanding of such bronchial dynamics. Both main stem bronchi arising from the trachea divide into smaller bronchi that supply the segmental units of the lung. Dichotomous division proceeds peripherally to the bronchioles. Alveolar ducts and alveolar sacs arise from the smallest bronchial divisions, the respiratory bronchioles. Bronchi vary in size from half the size of the trachea to 1.5 mm. diameter. Bronchioles have a diameter of less than 1.5 mm. Terminal bronchioles have a diameter of about 0.5 mm.

The trachea and the major distribution bronchi are stiffened by cartilagenous rings over a portion of their circumference. Irregular cartilage plates are found in the walls of smaller bronchi down to 1 mm. diameter. Smooth muscle fibers are present in the tracheal and bronchial walls as far peripherally as the terminal ends of the respiratory bronchioles. Elastic fibers are present in the bronchial walls throughout all portions of the tracheobronchial tree and extend even into the alveolar septa.

These anatomic structures are associated with bronchial peristalsis and the contour changes characterized by increase and decrease of luminal diameter and increase and decrease of bronchial and tracheal length.

Peristalsis is a function of the bronchial tubes. Rhythmic wavelike movements are demonstrable throughout the bronchial system by roentgen examination after the instillation of radio-opaque lipiodol. Peristaltic movements flow centrally and assist in the movement of mucus and foreign material in an oral direction. The combination of these wavelike motions with the expanding and constricting contour changes provides a squeezing action that is necessary for forceful movement of respiratory tract fluid. Bronchial peristaltic action is decreased by morphine and by the central nervous system depression that is associated with anesthesia.

Contour changes include alterations in luminal diameter and alterations in bronchial length. The smaller bronchi and bronchioles expand during inspiration and constrict during expiration. During inspiration the lung root moves downward, forward, and laterally and then returns to its original position during expiration. Thus the trachea and the bronchi become elongated during inspiration. As the thoracic cavity enlarges during inspiration and the lung expands to fill the cavity, the bronchial tubes are stretched out peripherally. The elastic fibers in the tracheobronchial walls cause the recoil during expiration.

Normally, the respiratory tract fluid bathing and cleansing the membrane and eliminating aspirated particles is brought to the larynx by ciliary action, peristalsis, and bronchial contour change and squeeze and is eliminated by swallowing. When there is any derangement in this physiologic secretory and eliminating mechanism, the cough mechanism becomes necessary.

Cough

Cough may be voluntary or reflex. The mechanism is composed of a deep intake of air followed by jerky expiratory movements against a closed glottis. The glottis then opens suddenly with an expulsive discharge and expecto-

ration. The air current produced by cough is violent. The chief muscle involved is the diaphragm, its amplitude during the paroxysm amounting to three or four times that of normal breathing. In addition, the abdominal muscles are powerfully contracted. The current of air inspired during the first phase of cough enters the lung distal to the plug of mucus because the diameter of the bronchial lumen is increased during this inspiratory phase. Sensitive trigger points for the cough reflex are located in the lower trachea and in the carina; there is probably very little sensation to initiate a cough reflex in the smaller bronchi. The reflex is depressed during anesthesia and during the postanesthesia period, and it is additionally depressed by sedatives administered for pain and through voluntary suppression by patients because of the pain associated with cough.

Anesthesia and Respiratory Tract Drainage

Physiologic secretion and drainage of respiratory tract fluid is seriously disturbed by operative procedures and anesthesia. Anesthetic drugs, sedatives given for pain, and pain itself all depress ciliary action, decrease peristalsis, diminish the natural stretching and recoiling bronchial movements, diminish luminal contour changes, and suppress the cough reflex. In addition, the use of drugs and the dehydration consequent upon operative procedures increase the viscosity of respiratory tract fluid by diminution of serous secretion from the tuboalveolar glands and by stimulation of exudate from the bronchial membrane. The bronchial tree may be flooded with aspirated gastric contents, pharyngeal secretions, and blood.

Tracheobronchial Aspiration

These secretions must be removed mechanically by tracheal aspiration. This must be done routinely throughout the anesthetic period and at the conclusion of the operative procedure, and it must be done when indicated during the postoperative period. Likewise, the cough reflex must be stimulated and coughing encouraged.

Tracheal aspiration may be accomplished by catheter suction through the direct laryngoscope or by bronchoscopic suction. In most instances, catheter aspiration is completely adequate. Tracheal aspiration during anesthesia need not be confined to patients who are intubated. A direct laryngoscope can be passed at any time without significant interference with anesthesia from removal of the mask. A cough reflex occasioned by passage of the catheter through the glottis should be eliminated during the operative period by spraying the larynx with 2 per cent pontocaine solution.

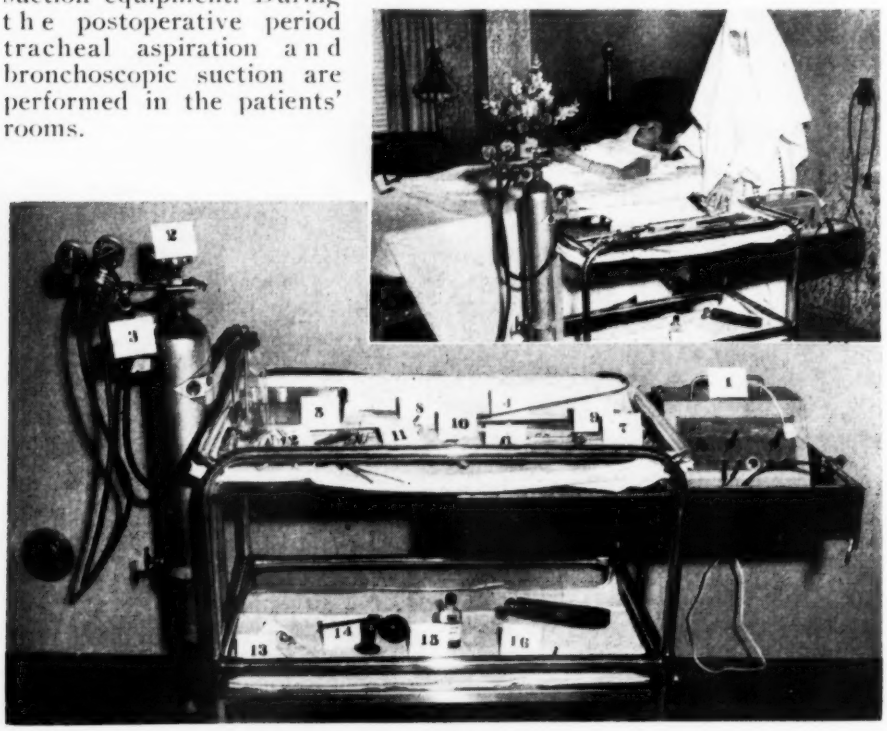
At the conclusion of the operative procedure direct laryngoscopic aspiration should be continued until the tracheobronchial tree is considered clear. At this time initiation of the cough reflex is advisable. This is stimulated best by insertion of the silk woven catheter to the carina.

Since the anesthetist's responsibility continues until the patient has awakened sufficiently to regain the cough reflex, some provision for pharyngeal and tracheal aspiration must be made for use

throughout the hospital. A specially designed cart containing the essential equipment for aspiration and suction is used at St. John's Hospital. This cart can be moved quickly to any operating room, ward, private room, or emergency room. It is provided with laryngoscopes, bronchoscopes, catheters, intratracheal tubes, equipment for topical anesthesia, bronchoscopic wet cell batteries (nine volts), oxygen, and suction equipment. During the postoperative period tracheal aspiration and bronchoscopic suction are performed in the patients' rooms.

SUMMARY

Removal by the anesthetist of accumulated secretions from the tracheobronchial tree during anesthesia and throughout the postoperative period has been responsible in large part for the reduced incidence of postoperative pulmonary complications. The function, production, and physiologic removal of these secretions are reviewed. The methods for removal by aspiration are indicated.



Aspiration and Suction Cart: (1) Wet cell battery; (2) oxygen; (3) suction; (4) aspirating tubes—(a) straight flexible, (b) curved flexible, (c) short velvet tip; (5) basin of water; (6) bite block; (7) Chevalier Jackson laryngoscopes; (8) endoscopic forceps with small sponges; (9) Chevalier Jackson bronchoscopes; (10) cross action anesthetizing forceps—(a) scissors, (b) cotton balls, (c) sponges; (11) infant intratracheal equipment—(a) intratracheal tubes, (b) suction tip, (c) laryngoscope; (12) adult intratracheal equipment—(a) laryngoscope, (b) intratracheal tubes; (13) K-Y lubricant and sponge; (14) anesthetizing atomizer; (15) pontocaine solution 2 per cent; (16) eye protector.

Emotional Aspects in Anesthesia

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Who will question the immeasurable benefits and alleviation of human suffering that have resulted from the application of the findings of science to the problems of medicine? Yet our precise and completely emotionless scientific technic has had a tendency to produce a mechanistic viewpoint towards man and a disregard for his dualistic nature. Within recent years a reformulation of the mind-body relationship has found favor under the title of psychosomatic medicine, which is actually not a new type of medicine but merely a psychologic orientation towards medicine and an awareness of the fact that no disease is entirely physical or entirely mental. The term is really redundant, since all disease is both physical and mental, and proper consideration must be given to both factors. The value of this type of approach is to place the emphasis on the patient who has a disease rather than on the disease. It is a reminder of the fact that the practice of medicine remains an art rather than an exact science.

Little study has been devoted to the significance of emotional states in the problems of anesthesia. The anesthetist must not lose sight of the fact that he is dealing not primarily with gases and gas machines but with thinking, feeling, living human beings, who, in addition to having gallbladders, appendices, and hernias, have worries, fears, anxieties, and frustrations along with other equally undesirable emotions.

To place one's life in the hands of another requires no small amount of confidence and courage. For the patient there is no such thing as a simple operation. Any surgical procedure requiring the use of general anesthesia is a serious event in his life, even though it may be routine for the surgical team. Fear is a natural human quality, and fear is a common emotion in the surgical patient. It is conditioned by the attitudes of the surgeon and of the hospital personnel, by the attitude of the patient towards his illness, by his previous medical and surgical experiences, by similar experiences of friends and relatives, and by his usual pattern of adaptation to stress-producing situations.

Effects of Fear

Fright, fear, and anxiety are all closely related and differ from

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each other only in intensity and duration. Fear readily becomes anxiety when it is dwelt upon and ruminated upon long enough. The effects of anxiety upon the physiologic functions of the body are well known and should be of particular interest to the anesthetist. Anxiety is capable of causing profound changes in the blood pressure, heart rate, capillary permeability, minute volume output of the heart, coronary blood flow, urinary output, rate and depth of respiration, and carbon dioxide content of blood. It is known that during a period of emotional tumult, such as is produced by fright or anxiety, the diaphragm actually shortens owing to muscular contraction, making it difficult to draw a long breath. Ventilation is dramatically modified, leading to sighing respirations. With an increase in depth or rate of respiratory excursion the carbon dioxide in alveolar air may be reduced as much as one half. With respect to the cardiovascular system, almost any cardiac arrhythmia may occur as the result of emotional stress. Sinus tachycardia is a common reaction of the heart to anxiety. The manner in which any given individual will react under a specific stress or strain will depend in large measure upon the set of adaptive patterns characteristic of that individual, which are determined by his previous responses to emotional experiences. Since these patterns of response are laid down early in childhood and may remain for the rest of one's life, it is well to consider the importance of making childhood surgical experiences as little traumatizing to the emotions as possible.

Fear of Death

A common cause of fear in the surgical patient is fear of death. This is a natural, understandable, human reaction, since the instinct of self preservation is one of the fundamental drives. The emotional preparation of the patient for an operation must be based upon the assumption that this fear exists, and every word and action of those with whom he comes in contact in the hospital must be designed to give him reassurance. He can truthfully be given assurance that his chances of dying in the operating room are actually less than if he were driving his auto or carrying out any of his usual daily activities.

In the event of an extreme emergency it is important that the patient should not be allowed to die in the operating room; every effort should be made to keep him alive until he returns to his room. This is important if proper attitudes regarding surgical and anesthetic procedures are to be established in the minds of his friends and relatives, since in the mind of the average lay person there is much more fear of dying in the operating room than of dying in bed. Therefore all possible measures must be taken to dissociate any connection between the patient's death and the operating room, for undoubtedly one or more of his family or friends will at some time require a surgical operation, and the emotional attitude of that person cannot but be influenced by the experience of having his friend or relative die during the procedure. The lay person is incapable of knowing all the circumstances that may have modified the situation, but he is certain of two things: This person

had an operation under general anesthesia, and now he is dead. Rumors start and spread with ease but are not stamped out with similar ease.

Fear of Mutilation

The fear of mutilation is closely akin to the fear of death, and it is not uncommon to hear a patient remark that he would sooner be dead than lose an arm or a leg or an eye. To a patient having a condition requiring the amputation of an extremity or part of an extremity, it can be pointed out that he can regain a high degree of function and excellent cosmetic results with modern prosthetic devices. Similar reassurance can be given him in regard to other mutilating operations.

Causes of Fear

Fear of dying from the effects of the anesthetic itself or fear of being strangled by it is to some extent a carry-over from the early days of anesthesia, when, for example, ether was poured on the mask until the patient stopped struggling. Memories of such experiences are hard to live down and gain much in the retelling. The best method for stamping out tales of this type lies in the hands of anesthetists themselves and consists of the administration of smooth anesthesia.

A practice also calculated to arouse fear and apprehension is the unnecessary habit of strapping the conscious patient tightly to the operating table, and this is particularly pernicious in the case of children. It seems to have become an accepted but necessary evil that before a child can be successfully anesthetized he must first become a crying, struggling, kicking, screaming, terrified bundle of humanity. How much better it would be to induce anesthesia with the child in a sitting position or in an induction room where he can fondle a pet toy and listen to a familiar nursery rhyme or bedtime story. It is impossible to estimate the amount of damaging emotional trauma that has been produced in the developing personalities of children by experiences during the common, wholesale, and lucrative procedure of tonsillectomy.

It also seems to be an accepted procedure to tell the child nothing about what is to be done to him or even to tell him deliberate falsehoods under the misapprehension that "what he doesn't know won't hurt him." It is assumed that he is incapable of understanding anything of what is going on, and the whole situation is clothed in that secrecy with which the medical profession has for so long vested itself and which results only in an increase in the fears and apprehension that have already been aroused by the clean, antiseptic, impersonal atmosphere of the hospital.

The proper conduct of the anesthetic procedure begins with the preoperative visit of the anesthetist to the child in an effort to know him, to talk with him, and to win his confidence. There is no reason why during this visit the child cannot be shown the anesthetic mask and allowed to handle it and place it over his own face. These attentions are as applicable to adults as to children. Explanations making use of scientifically sound, technical terms do nothing to alleviate a patient's anxiety and, if anything,

only arouse more fear. No matter how simple the "-ectomy" or "-otomy" may be to the surgical staff, it still sounds like something serious to the patient, particularly when he overhears these matters being discussed by the physicians and nurses.

Fear of Pain

Fear of pain is entirely unnecessary in view of the variety of analgesic drugs now available. Preoperative medication, however, is not the entire answer. Fears and anxieties are not removed by drugs, but courage is instilled by a staff that is alert to the existence of and reasons for these fears and anxieties in the surgical patient. In the presence of kindness and understanding on the part of all those to whom the patient entrusts his care, the situation loses some of its frightening aspects. A cold, impersonal, mechanical, irritable nurse may be completely efficient in giving the proper dose of preoperative medication but may be completely incapable of understanding and satisfying the emotional needs of the patient, to the extent of undoing any benefits derived from the medication.

Fear of Unconsciousness

Many persons are frightened by the thought of losing consciousness, or they fear that while under the influence of the anesthetic they will reveal secrets. Others fear the after-effects of anesthesia. Again, proper premedication and the administration of smooth anesthesia are the best advertisements in breaking down the barriers of tradition and in discrediting some of the tales stemming from experiences with poorly administered anesthesia. Some of these tales concern the excitement stage, which, far more being a normal part of the anesthetic procedure, constitutes poor anesthesia and must be regarded as an anesthetic complication. It must also be kept in mind that during induction the sense of hearing is the last to be lost and, in fact, becomes especially acute, so that sounds may be distorted. The general atmosphere of the operating room, therefore, should be one of subdued quiet, with conversation being held at a minimum and with the elimination of all harsh and extraneous sounds and noises. The construction of separate induction rooms providing a quiet restful environment and the use of soothing music are innovations that are not impracticable.

Summary

The practice of anesthesia, like the entire field of medicine, is an art rather than a science. As a science its technic can be mastered with considerable skill, but as an art, as is true of all arts, it requires careful nurturing, experience, and practice. The art of anesthesia must be cultivated by acquiring a broad view of the mental and emotional needs of the patient. The first step in acquiring this viewpoint is to recognize that a problem exists. When the anesthetist learns the structure of the normal personality and how it is altered as the result of the illness of the patient, he will be on the way to becoming an integrated and more important member of the operating team and less of a technician.

Evaluation of the Surgical Patient for Anesthesia

Douglas Eastwood, M.D., Morton D. Pareira, M.D., and Burton Shatz, M.D.
St. Louis

DR. PAREIRA: The title of this panel discussion is "Evaluation of the Surgical Patient for Anesthesia." The most complex problems of evaluation are posed by the surgical-risk patient. We are applying the term "surgical-risk patient" to the patient in whom the expectations for morbidity and mortality are greater, by virtue of complicating or coincident pathologic conditions, than those normally anticipated from the specific operation and anesthesia to which he is to be subjected. Management of the surgical-risk patient is the joint responsibility of the anesthetist, the internist, and the surgeon. The first decision to be made is whether or not the indicated operation should be performed, and this is arrived at by weighing the prognosis of the untreated surgical disease against the estimated risk of anesthesia and operation. If operation is elected, the problem of choice of anesthetic agent arises. In selecting the agent one must consider its safety in terms of the pathologic condition present and whether its use is feasible in the light of the operative procedure contemplated. These considerations are interrelated, and when they are antithetical, compromises must be made.

We plan to consider some specific clinical problems in consultation as is done in actual practice. Dr. Douglas Eastwood, chief of the anesthesiology department of Washington University School of Medicine, is the anesthesiologist on our panel. Dr. Burton Shatz of the department of medicine, Washington University School of Medicine, is the internist on the panel. I am a general surgeon, and I am also associated with the Washington University School of Medicine.

I have a man, 55 years old, who has a history of jaundice of three weeks' duration, and who has been hospitalized for the past week. The type of jaundice has not been determined, and the internist and I think that he should undergo an exploratory operation. Probably, our main concern in this particular patient is the state of liver function.

Panel discussion before the Eighteenth Annual Meeting of the American Association of Nurse Anesthetists, St. Louis, Sept. 19, 1951.

DR. SHATZ: In evaluating a jaundiced patient with respect to anesthesia the first step is to determine whether liver function has been impaired. Jaundice may be present for four to six weeks without actual liver impairment if the jaundice is the result of extrahepatic obstruction, such as that caused by a stone or carcinoma of the head of the pancreas. However, if the jaundice is secondary to diffuse liver disease, such as cirrhosis or hepatitis, the liver function is severely impaired. If there is no associated impairment of liver function, there is no increased risk as far as anesthesia is concerned. However, for the patient who has hepatitis or cirrhosis of the liver, anesthesia is a definite hazard, and one must select an agent that will not damage the liver further.

An evaluation of liver function can be made by analysis of the urine for bile and urobilinogen, determination of total and fractional proteins in the blood, the cephalin-cholesterol flocculation test, and some liver excretion test such as the bromsulfalein test. Dr. Eastwood, what anesthetic agent would you consider to be the least likely to increase any liver impairment that may be present?

DR. EASTWOOD: In selecting the best anesthetic for this particular patient I think two things have to be taken into consideration. One, as you mentioned, is to avoid an agent that may further damage the liver, and the other thing is to avoid those agents that may prolong anesthesia, although they may not of themselves damage the liver. Those agents causing delayed recovery include the barbiturates, possibly pentothal sodium, but at least the longer-acting barbiturates. Those that can damage the liver include avertin, chloroform, ethyl chloride, and Vinethene and to a lesser extent ether. Probably, the least damaging of the agents that produce total anesthesia would be cyclopropane. Nitrous oxide and ethylene have very little effect on liver function, but they are so weak that they have to be used with other depressant drugs, which may cause the recovery of the patient to be delayed.

DR. SHATZ: Dr. Eastwood, would you say a word about the proper preanesthetic medication for a patient with liver damage?

DR. EASTWOOD: The barbiturates will delay recovery, and I think that if cyclopropane is the anesthetic chosen the barbiturates will actually hinder rather than help the induction of anesthesia. The barbiturates produce enough depression of respiration to cause shallow respiration, which in turn will delay induction. Also, the barbiturates are parasympathomimetic in their action and therefore probably increase bronchospasm and laryngospasm, which cyclopropane may also do. The administration of morphine may result in some delay in recovery if it is used in excessive doses in the presence of liver damage, but I don't think that it will primarily cause liver damage. For this patient I would select 10 mg. morphine and 0.4 mg. scopolamine given

at least ninety minutes before induction of anesthesia.

DR. PAREIRA: In terms of operating time, a case like this is unpredictable. The procedure might last twenty minutes if the condition is one for medical treatment. On the other hand, if we find it requires surgical treatment and the technical procedure proves difficult, the operation might last for some hours. Would that alter your choice of anesthetic agent?

DR. EASTWOOD: That possibility would support my choice of cyclopropane, for it can be used for rapid induction for short procedures with the patient promptly awake at the end of the procedure, and it can be used for very long operations with relatively little trauma to the patient.

DR. PAREIRA: Your choice is quite acceptable to me. You speak of the advantages of cyclopropane not only for anesthesia of short duration in a case such as this but also for anesthesia for a long operation. Are there any agents used for anesthesia for abdominal operations that you would consider contraindicated in the event of a long procedure?

DR. EASTWOOD: Of course, chloroform, ethyl chloride, and Vinethene could not be used for long procedures. Ether may be indicted to some extent for damaging liver cells, but I think this rather unlikely if adequate oxygenation and normal carbon dioxide tension are maintained throughout the procedure and, of course, if the patient is kept out of shock. Anoxia and shock in a patient like this would be much more serious than any pharmacologic damage from the agent itself. Fractional spinal anesthesia may also be used to advantage when the operative time may be either long or short. A small dose may be given for a short procedure and repeated doses given for longer operations. Its main disadvantage in this case would be the occurrence of shock and hypoxia if the decrease in blood pressure caused by the spinal anesthesia were not corrected.

DR. PAREIRA: I have a woman, aged 40, with a breast tumor that is clinically malignant, and radical mastectomy will almost certainly be necessary. Dr. Shatz states that the patient has chronic glomerulonephritis. Because of this and the fact that regional anesthesia is not going to be feasible for the contemplated precedure, I want to know whether the risk warrants the operation, and, if so, what the choice of anesthetic agent will be.

DR. SHATZ: In evaluating a patient with chronic glomerulonephritis the important question, in general, is whether the kidney disease has advanced to the point where there is evidence of impairment of renal function. In other words, has the diagnosis been made on the basis of albumin in the urine with no evidence of retention of waste products of metabolism, or does this patient actually have an elevation in blood nonprotein nitrogen and the other signs of uremia. If a patient has a history of having had glomerulonephritis ten years be-

for and since the acute episode has been well except for persistent albuminuria, and if there is no elevation of nonprotein nitrogen, and renal function tests are relatively normal, the risk of anesthesia is not great. However, the patient under discussion has a history of having had acute glomerulonephritis twenty years before her present illness. At the present time the nonprotein nitrogen is elevated, and there are red blood cells and casts in the urine, which indicates that the renal lesion is active. Therefore, the anesthetic must be carefully selected to prevent further impairment of remaining kidney function. In general, the agent should not contribute to hypotension, hypoxia, or vasoconstriction of the renal vessels and should have no toxic effect on the kidney. Dr. Eastwood, which anesthetic agent would fulfil these requirements.

DR. EASTWOOD: There is no such agent. And anyway it's not the agent; it's the anesthetist that is going to make the difference. Hypoxia can occur with any of the routinely administered anesthetic agents. Agents that may damage the kidney include ether, choloform, ethyl chloride, and avertin. Cyclopropane seems to be the least irritating to the kidney in that fewer patients have casts, albumin, or red cells in the urine after cyclopropane has been used as the anesthetic. I think that nitrous oxide could be used with sedation with such drugs as morphine or pentothal sodium. I don't think that the elimination of pentothal sodium through the kidney is going to be of too great importance in this particular procedure.

I would like to ask one question. Presuming that the carcinoma is cured, what is the chance that this woman will survive the operation for several years in view of the kidney lesion?

DR. SHATZ: The presence of an elevated nonprotein nitrogen level in a patient with chronic kidney disease makes giving a definite prognosis difficult. However, it is not unusual for a patient to live two to three years or longer with a definite, and sometimes very pronounced, elevation of the nonprotein nitrogen level. So while this patient has a malignant process in her breast that could terminate her life before the kidney lesion, I think we are forced to operate to give her the benefit of any difference between the time she would die from the carcinoma and the time death might be caused by kidney failure.

DR. PAREIRA: Dr. Eastwood, what would your choice of anesthetic be in this case? I would also like to ask you, since you mentioned pentothal sodium as one of your choices, whether pentothal sodium would still be one of your choices if the operation might last four hours?

DR. EASTWOOD: As a final choice of anesthetic cyclopropane would probably be a good selection. Nitrous oxide and pentothal sodium would be a fairly satisfactory combination, because during the last portion of the operation the amount of pentothal sodium used would be small. A poor choice would be ether anesthesia, since ether has been shown

to cause some albuminuria and cast formation. In some cases I believe it has caused a flare-up of chronic glomerulonephritis with a fatal termination. How about that, Dr. Shatz?

DR. SHATZ: I have had no experience with such a complication.

DR. PAREIRA: From my standpoint, either cyclopropane or nitrous oxide supplemented with pentothal sodium would be a satisfactory choice of anesthetic agent.

DR. SHATZ: Before we leave this case, we should consider the fluid intake of the patient with kidney disease during the operation, since fluid administration is frequently under the control of the anesthetist. During and prior to the operation special care should be taken to keep the patient well hydrated in order to maintain a good urinary volume in the immediate postoperative period.

DR. PAREIRA: On the ward there is a woman, aged 40, with partial intestinal obstruction. Contrast radiography revealed a lesion of the sigmoid, which is probably carcinoma. The patient will need an exploratory operation and will probably have to have an intestinal resection. She is quite obese, and she has a history of cardiac decompensation, which was controlled with digitalis. She still requires digitalis in order to sustain cardiac compensation. Electrocardiogram is reported as showing some myocardial damage and a left axis deviation. Dr. Shatz, what is your evaluation of the cardiovascular status of this patient?

DR. SHATZ: In general, the most important factor in evaluating a patient with cardiac disease, with respect to his tolerance of anesthesia and an operation, is his exercise tolerance at the time the operation is being contemplated. If a patient with cardiac disease on a digitalis regimen can endure a moderate amount of physical exertion without dyspnea and without precordial pain, his chance of withstanding a major surgical procedure is good. However, if he has severe shortness of breath on walking short distances, is unable to climb stairs, or has precordial pain, the risk of the surgical procedure is greatly increased. The digitalis has apparently been effective in compensating for the heart failure in this patient at the present time, and she apparently is getting along well. The fact that the electrocardiogram shows some myocardial damage is of really no significance in itself as far as her ability to tolerate the operative procedure and anesthesia is concerned. The maintenance of maximal oxygenation of the blood at all times is the main factor to be considered in selecting the type of anesthesia to be used. Dr. Eastwood, what type of anesthesia do you prefer in a case of this type?

DR. EASTWOOD: Dr. Shatz, you redeem yourself in discussing this particular patient. For once, you said "in evaluating a patient for surgery" as well as for anesthesia. It sometimes is forgotten by the internist and anesthetist that the patient is undergoing an operation

as well as anesthesia and has the risk of surgery as well as the risk of anesthesia. The choice of anesthetic for this particular procedure will depend upon whether with the agent selected adequate oxygenation can be maintained throughout the procedure. If this can be done with nitrous oxide-oxygen-pentothal sodium-curare satisfactorily—and in my experience that is a little difficult—this combination could be used. If continuous spinal or fractional spinal anesthesia can be administered without reducing the blood pressure and thereby causing hypoxia, that method would be satisfactory. In some cases this also can be difficult. If the particular anesthetist is competent in the use of chloroform-oxygen anesthesia, it could be used; however, it would not be my choice. Ether anesthesia, surprising as it may seem, would be my particular choice in this case, because adequate oxygenation could be maintained. The reason I would not be likely to choose cyclopropane is a minor one, and it is that the patient is on a digitalis regimen. Digitalis does sensitize the myocardium to some extent, and the possibility that arrhythmias, of sufficient significance to necessitate switching to ether, would occur during the anesthesia is great enough for my choice to be ether in the beginning.

A very important thing to decide at the outset is the position of the patient who has been partially decompensated and is on a digitalis regimen. The Trendelenburg position, although it might get the intestines out of the pelvis, might put enough strain on this particular woman to precipitate left ventricular failure. What is your feeling about that, Dr. Pareira?

DR. PAREIRA: I do not believe that it would be necessary for us to place this patient in the Trendelenburg position, and since you have a valid objection, I can readily say that it certainly need not be done.

DR. EASTWOOD: One thing we worry about in evaluating such a patient—perhaps rightly, perhaps wrongly—is whether we are going to precipitate cardiac decompensation by the administration of blood and fluids. The patient is going to lose some blood, and it will have to be replaced. Dr. Shatz, what is your feeling in regard to fluid therapy? Should we attempt to restrict the administration of fluids, or should it be adequate? Also, if cardiac decompensation is a possibility either from overloading the circulatory system with fluids or from other causes, what signs of acute cardiac decompensation should the anesthetist look for during the precedure?

DR. SHATZ: In answer to your first question, I believe that enough blood should be given to correct hypotension. Shock can be especially dangerous in a patient with coronary artery disease, since it causes decreased coronary blood flow and may precipitate myocardial infarction. With respect to the administration of other fluids, such as glucose and saline solutions, I think we could be a little conservative. If the patient is not in shock, only enough saline solution should be

administered to replace what has been lost. You also asked what the anesthetist should look for in order to recognize acute heart failure in a patient on the table. The usual signs of heart failure may be masked by anesthesia. However, one can easily detect sudden increases in pulse rate, an increase in respiratory rate, the development of cyanosis, the appearance of a pink frothy fluid in the mouth, grossly audible bubbling respiratory sounds, venous distention in the neck, and difficulty in ventilating the patient's lungs when compressing the rebreathing bag.

DR. EASTWOOD: We run into the following situation too often: Blood replacement appears to have been adequate, and yet the blood pressure remains low in a patient with known cardiac weakness. Then somebody poses the question of whether the patient's myocardium is too weak to increase the blood pressure as measured in the brachial artery. What about that, Dr. Shatz?

DR. SHATZ: If the patient entered the operating room with a normal or elevated blood pressure, his myocardium at that time was certainly strong enough to maintain the normal pressure. And if there is a sudden decrease in blood pressure while he is on the operating table, something must have happened after the operation started. The things to be considered are, first, blood loss, and if one is certain that blood loss is not responsible for the sudden decrease in blood pressure, then, second, coronary occlusion with myocardial infarction. If this is the cause of the sudden decrease in blood pressure, the operation should be terminated as soon as possible. Some persons think that transfusions of blood and plasma and the administration of certain vasoconstrictor drugs, such as norepinephrine, are of value in increasing the blood pressure if shock persists. However, making a diagnosis of myocardial infarction during the course of an operation while the patient is under anesthesia is so difficult that the anesthetist should not feel responsible for making it.

DR. PAREIRA: In the situation that you describe, Dr. Shatz, my peference would be to start an intra-arterial transfusion rather than to persist in the administration of intravenous transfusions and vasoconstrictors. Is intra-arterial transfusion contraindicated by the cardiac condition we are considering?

DR. SHATZ: No. On the contrary, intra-arterial blood transfusion with careful regulation of the blood pressure would be the transfusion of choice if transfusion were deemed necessary.

DR. PAREIRA: I have a man, aged 28, with a traumatic rupture of the spleen. The patient has been hospitalized for a number of hours and is still in shock in spite of the administration of several units of blood and oxygen and other supportive measures. His blood pressure is 80 mm. Hg systolic and 60 mm. Hg diastolic, his pulse rate is 120 per minute, and his respirations are rapid and shallow. I think that it is

necessary to take him to the operating room immediately. Before we do, is there any very rapid medical measures that you might advise, Dr. Shatz?

DR. SHATZ: I have nothing to suggest except that oxygen therapy by mask or nasal catheter be started immediately.

DR. PAREIRA: Well, that puts the problem in your lap, Dr. Eastwood. We hope the precedure will not be too long. I know you will take care of oxygenation during the operation, and we shall certainly administer oxygen postoperatively. What are your suggestions?

DR. EASTWOOD: I want to say a little more about oxygenation. As soon as the patient is seen, oxygen administration should be started and should not be stopped until administration of anesthesia is started. In other words, oxygen administration should be continued while he is being taken to the operating room, and, while other preparations are being made, oxygen should be administered from the gas machine to reduce the possibility of hypoxic damage that can occur from shock. The next most important point in regard to this patient is to eliminate the administration of any drug that in itself may depress the protective mechanisms of the circulatory system. This man should not receive morphine for premedication. A small dose of atropine or scopolamine should be sufficient. Morphine, although it might allay apprehension, could in itself depress the compensatory mechanisms to some extent and should not be used. The same is true of pentothal sodium. Pentothal sodium or other barbiturates should not be used for induction of anesthesia in this particular case. It might be a good idea to have an arterial transfusion set at hand in case blood loss is severe during the procedure, so that at least the blood supply to the heart and brain can be maintained with greater facility. My choice of anesthetic would be cyclopropane. However, almost any anesthetic agent with which the anesthetist is familiar could be used in this case. The choice of agent is comparatively unimportant, but the method and dexterity with which it is administered are very important. There is a saying that you want to "hit these people with a feather," and whatever agent is used should be administered with finesse and caution, because only a very small amount will probably be needed by this particular patient who is in shock.

An important point to keep in mind is that anesthesia is the process of making a person partially dead. The closer a person is to being dead, the less anesthetic it takes to accomplish the particular purpose desired and also to produce death. The converse is also true. A vigorous, alive individual requires more of the anesthetic agent to produce the same degree of anesthetization. Some interesting work was done about five years ago by Chambers and Zweifach, who showed that the compensatory mechanisms against shock remain present during cyclopropane anesthesia but are lost during pentothal sodium-nitrous oxide anes-

thesia and during ether anesthesia. For this reason I would prefer cyclopropane to ether. A poor choice for this type of procedure would be spinal anesthesia.

DR. PAREIRA: I am quite amenable to your choice, Dr. Eastwood. I want to mention that it is very important in light of the pathologic condition present that in the early part of the operation we have good relaxation almost at any cost. We need this for only a short time, the time necessary to ligate the pedicle of the spleen.

DR. EASTWOOD: The relaxation can be easily provided by the use of moderate doses of curare early in the procedure. I certainly agree with you. There are times when the anesthetist may believe that there is a definite risk to increasing the depth of anesthesia by making use of curare, but the total safety for the patient may be greater if needed relaxation is provided at these crucial moments.

DR. SHATZ: Dr. Eastwood, this man has a ruptured spleen because he fell from a second story window, and he has a great deal of pain. In the face of this fact would you still say that morphine should not be given because of the shock? Many of us have been taught that morphine is one of the best of the few drugs that are of any value in the treatment of shock. Would you explain further your position with respect to administering morphine to the patient with shock, restlessness, and pain?

DR. EASTWOOD: It is not common to have both pain and shock, because shock itself reduces pain. If he has both, certainly enough morphine to lessen the pain to the tolerable stage should be given, and it should be administered intravenously. A patient in shock obviously is not going to be benefited by morphine administered subcutaneously or hypodermically. For this man of 28 years of age as little as gr. 1/12 or gr. 1/8 would probably be sufficient to relieve his pain and would not be likely to depress the circulation much. As to the best drugs for treating shock, I still think of oxygen; at least I call it a drug.

DR. PAREIRA: When the patient was first admitted in mild shock he had severe pain, and I consequently gave him morphine. From that time until this no morphine has been administered, and I am in hearty agreement with Dr. Eastwood. I think that morphine should be given only to the patient who is experiencing severe pain, and, as Dr. Eastwood points out, such a patient is not in severe shock.

DR. PAREIRA: I have a man, aged 40, who has been subject to recurrent massive hemorrhages from a duodenal ulcer. The patient is not bleeding rapidly at the moment, but he has a moderately severe anemia, and, incidentally, he also has chronic asthma. We do not want to give him blood transfusions too much longer for fear that while we are waiting for the complete control of the anemia he will begin to have hemorrhages again, so I am very anxious to get him to surgery.

I wonder what help the anesthetist and internist can offer here.

DR. EASTWOOD: As far as I am concerned, there are two major problems here. We need adequate relaxation for an abdominal operation on a patient who is anemic and who has bronchial asthma. Of the two conditions I think the bronchial asthma is the more important. Bronchoconstrictors include, first of all, cyclopropane, second, barbiturates, and, third, undoubtedly curare. Morphine has been indicted as a possible cause of difficulty in the patient with bronchial asthma, but the precipitating factor may be respiratory depression rather than bronchoconstriction. I believe we should avoid using the agents mentioned and use one that has been accepted as good therapy for bronchial asthma, namely, ether. Ether would be my particular choice for this patient; I would use nitrous oxide for induction and eliminate the pentothal sodium if possible to reduce the possibility of bronchospasm. If curare is needed, decamenthonium iodide would be my choice, since it does not appear to have any bronchoconstricting action. The question of spinal anesthesia comes up. If the patient has severe bronchial asthma at the time of operation and is having respiratory difficulty, the paralysis of intercostal and abdominal muscles produced by spinal anesthesia would so limit respiration that he would have respiratory embarrassment. Therefore spinal anesthesia is not a good way to circumvent the problem of bronchial asthma, especially if an upper abdominal operation is contemplated. Probably, a better choice for this procedure would be ether anesthesia.

DR. PAREIRA: You have emphasized the bronchial asthma, Dr. Eastwood. I wonder what you think about the ability of the anesthetist to compensate for the diminished oxygen transport that is present in anemia, and I wonder what you consider a critical level of hemoglobin in terms of a patient undergoing an operation and anesthesia.

DR. EASTWOOD: I should not have passed over the question of anemia. It definitely is important, and agents with a high oxygen tension should be used. A very important factor is the amount of reduced hemoglobin it takes for cyanosis to be apparent. On an average it takes 5 Gm. of reduced hemoglobin before cyanosis is apparent through the intact skin. This means that if the patient has only 5 Gm. of hemoglobin every bit of hemoglobin in his bloodstream has to be reduced hemoglobin before he will show cyanosis, and that means he is nearly dead. For an elective operation 10 or 10.5 Gm. is the minimum that should be accepted. In emergency situations, as represented by this case, the patient can get along with a hemoglobin level less than that recommended for elective procedures. Dr. Shatz, what would you suggest from a medical standpoint in this case?

DR. SHATZ: Because the patient has severe asthma, a continuous intravenous infusion of a bronchodilator, such aminophylline, should be given throughout the operation. Also, if the asthma is severe or of

the type that does not respond to the usual bronchodilators, I think that ACTH might be considered in the treatment of this patient. However, the fact that he has a bleeding ulcer might make this hazardous. I should like to ask Dr. Eastwood what he thinks about giving a patient of this type oxygen under positive pressure during the operation in order to increase the oxygen-carrying capacity of the blood?

DR. EASTWOOD: Increasing the oxygen concentration from the 20 per cent of room air to about 93 per cent with ether anesthesia will increase the amount of dissolved oxygen in the plasma some 15 per cent, so that 15 per cent more oxygen can be given merely by increasing the inhaled concentration. If we increase the positive pressure in the system to 5 cm. of water above atmospheric pressure, we can add very little to the amount of oxygen that will pass the pulmonary membrane. I think it would be very bad to give this patient oxygen under positive pressure. In fact, we could precipitate shock in this patient by giving him oxygen under positive pressure. The blood returning to the heart from the abdomen, upper extremities, and head would be limited because of the increased intrathoracic pressure. When the return of blood is restricted by 5 cm. of water pressure, the venous return to the heart is reduced, the cardiac output is reduced, and shock results. In a patient who has cardiac decompensation, we want to decrease the venous return. Oxygen administered under positive pressure actually produces the same result as tourniquets applied to the extremities. It is a form of bloodless phlebotomy. I think it's indicated in cases of cardiac decompensation, but it would be definitely dangerous in this case.

DR. PAREIRA: The surgical service has been asked to see a child, aged 6, who has been hospitalized the past three days with lobar pneumonia. This morning the child was found to have a strangulated inguinal hernia, and an emergency operation is now necessary. Dr. Eastwood, what would you recommend in this case?

DR. EASTWOOD: Two things are very important in this case. First of all, we don't want to dry up this boy's secretions, because anything that tends to thicken the secretions will probably aggravate the pneumonia. Secondly, he should be awake as soon as possible after the operation so that he can get rid of secretions. He is probably too young to be a candidate for spinal anesthesia, although in many places that would be the type of anesthesia used. I am not familiar with the technic for children of this age, so I cannot discuss that part of it. Probably, I would elect to use cyclopropane or ether. I would choose cyclopropane because the possibility of creating more secretions would be minimized with this agent. Since he has had a fever and has a pulmonary complication, I am going to suggest that atropine be eliminated from the premedication.

DR. PAREIRA: Your choices are quite acceptable to me, Dr. Eastwood. I also have had no experience with spinal anesthesia for children of this age, and it goes without saying we would not want to depress this child sufficiently to make local anesthesia feasible. What about intratracheal anesthesia in this case, Dr. Eastwood?

DR. EASTWOOD: That is a very good suggestion. This child undoubtedly has some secretions that he is not going to cough up during the period of anesthesia. They can be removed through the intratracheal tube. The possibility of difficulty from the added trauma of the intubation is less than the possibility of difficulty from retained secretions, and I would recommend that an intratracheal tube be used during this procedure.

DR. PAREIRA: We have a boy, aged 12, down in the emergency room who climbed an apple tree for dessert after lunch today. He fell out and sustained a displaced fracture of both bones of the forearm. I want to bring up the question of reduction of the fracture under anesthesia. What do you suggest, Dr. Eastwood?

DR. EASTWOOD: Unfortunately, this is a common occurrence, and it presents problems for which it is difficult to find a good solution. It is an emergency situation. The first step is to empty the stomach. That sounds easy, but the use of a stomach tube will not empty it entirely. With the use of very light analgesia the patient is not anesthetized sufficiently to lose the gag reflex, and if vomiting does occur, the patient is able to remove secretions from the pharynx before they can be aspirated. In this particular circumstance this technic would not be satisfactory. A common trick is to anesthetize the patient with open drop ether and deliberately instigate vomiting during the induction stage so that the stomach is rapidly emptied while the child is still able to cope with vomiting. The other solution, which is not applicable in this case but is in certain circumstances, is to introduce an oral intratracheal tube with a cuff under topical anesthesia. The patient has a guaranteed patent airway, which cannot be contaminated by gastric contents before he is anesthetized. This technic can be utilized in cases of intestinal obstruction and duodenal bleeding in which the stomach is very full and in cases of accidents resulting in fractured jaw or fractured maxillofacial bones requiring an emergency operation. I also should mention that, although all these precautions are used, the aspiration of a certain amount of material may occur. Intratracheal equipment with suction apparatus must be at hand in all cases. The suction apparatus must be used with facility to clean the pharynx as soon as material is brought to it from the esophagus. I think in this particular case the technic of the individual giving the anesthetic is important. The ability of that person to remove the secretions from the pharynx, rather than any hypothetical management for the particular circumstances that arise, will determine the outcome. The use of the lateral or Trendelenburg position during vomiting is important.

Notes and Case Reports

Anesthesia for Pelvic Evisceration.—After reading the discussion of complications of anesthesia in the November 1951 issue of the JOURNAL (page 223), it occurred to me that a report of four cases of anesthesia for pelvic evisceration as conducted at the Memorial Hospital, Wilmington, Delaware, might answer one or two of the questions asked. The operation consists of a complete or incomplete pelvic and perineal evisceration with ureterocolostomy and is performed for advanced carcinomatosis confined to the pelvis.

Pentothal sodium is used for induction of anesthesia, and anesthesia is maintained with the intratracheal administration of cyclopropane, oxygen, and ether, *d*-tubocurarine chloride being used for relaxation. Generally, ether is used in only small amounts as a "splint" to the heart to prevent cardiac irregularities. The most satisfactory method to date has been the administration of pentothal sodium, 375-500 mg., accompanied by syncurine, 3-4 mg., which gives adequate relaxation for the introduction of a Sanders intratracheal tube with inflatable cuff. The aforementioned agents are then administered throughout the operative procedure, with nitrous oxide and oxygen being used at the termination of the operation to eliminate the cyclopropane.

These operations are long tedious procedures and are accompanied by massive blood transfusions, frequently under positive pressure, with 500 cc. blood being administered in as little as five minutes in some cases. A large percentage of the patients are without measurable pulse or blood pressure for long periods.

CASE 1.—A woman, aged 56, had a diagnosis of metastatic carcinoma of the vaginal apex, left parametrium, and perivesical tissues. The operation to be performed was incomplete pelvic and perineal evisceration with ureterocolostomy.

Preoperatively, the blood pressure was 124 mm. Hg systolic and 48 mm. Hg diastolic. Pulse rate was 88 a minute.

Preoperative medication consisted of morphine, gr. 1/8, and scopolamine, gr. 1/150. Anesthesia was induced at 8:25 a.m. and was terminated at 7:05 p.m. Pentothal sodium, 300 mg., and *d*-tubocurarine chloide, 3 mg., were used for induction. A Sanders tube with inflatable cuff was introduced. The anesthetic agents used were cyclopropane, nitrous oxide, oxygen, and ether, with *d*-tubocurarine chloride for relaxation. During this ten and one-half hour anesthesia 45 mg. *d*-tubocurarine chloride was used. The blood pressure ranged between 160 mm. Hg systolic and 110 mm. Hg diastolic and 90 mm. Hg systolic with an immeasurable diastolic pressure. The pulse rate ranged between 116 and 60 a minute. For forty-five minutes the blood pressure and pulse were imperceptible. Respirations were controlled. This patient received 11,000 cc. blood; 6,000 cc. dextrose in distilled water; and 2,250 cc. plasma, for a total of 19,250 cc. of fluid.

At the termination of the operation the blood pressure was 120 mm. Hg systolic and 90 mm. Hg diastolic; pulse rate was 86 a minute; respiratory rate was 24 a minute. This patient had a satisfactory recovery.

CASE 2.—A woman, aged 37, had a diagnosis of recurrent papillary cyst adenocarcinoma of the ovary involving the pelvis with metastasis to the cervix. The

proposed operation was complete pelvic evisceration with ureterocolostomy.

Preoperatively, the blood pressure was 130 mm. Hg systolic and 80 mm. Hg diastolic. Pulse rate was 76 a minute.

Preoperative medication consisted of demerol, 100 mg., and scopolamine, gr. 1/150. Anesthesia was induced at 8:15 a.m. and was terminated at 11:30 p.m. Pentothal sodium, 500 mg., and syncurine, 3 mg., were used for induction, and a Sanders tube with inflatable cuff was introduced. Anesthetic agents used consisted of cyclopropane, nitrous oxide, oxygen, and ether, with *d*-tubocurarine chloride for relaxation. During this fifteen and one-quarter hour anesthesia 33 mg. *d*-tubocurarine chloride was used. For two and one-half hours during the operation the blood pressure and pulse were either imperceptible or questionable. During the rest of the time the blood pressure ranged from 170 mm. Hg systolic and 110 mm. Hg diastolic to 86 mm. Hg systolic and 70 mm. Hg diastolic. This patient received 12,250 cc. blood and 3,000 cc. dextrose in distilled water, for a total of 15,250 cc. fluid.

At the conclusion of the operation the blood pressure was 110 mm. Hg systolic and 70 mm. Hg diastolic; pulse rate was 104 a minute; respiratory rate was 28 a minute. This patient had a satisfactory recovery.

CASE 3.—A woman, aged 42, had a diagnosis of recurrent cancer of the cervix with secondary squamous cell carcinoma of the bladder. The operation was complete pelvic evisceration with bilateral ureteral transplantation.

Preoperatively, the blood pressure was 100 mm. Hg systolic and 60 mm. Hg diastolic; pulse rate was 88 a minute; respiratory rate was 20 a minute.

Preoperative medication consisted of demerol, 100 mg., and atropine, gr. 1/150. The anesthesia was started at 8:15 a.m. and ended at 3 a.m. Anesthesia was induced with pentothal sodium, 500 mg., and syncurine, 3 mg., and a Sanders tube with inflatable cuff was introduced. The anesthetic agents used were cyclopropane, nitrous oxide, oxygen, and ether with *d*-tubocurarine chloride for relaxation. During this eighteen and three-quarter hour operation 42 mg. *d*-tubocurarine chloride was used. The blood pressure ranged between 130 mm. Hg systolic and 90 mm. Hg diastolic and 70 mm. Hg systolic with an immeasurable diastolic pressure. Pulse rate ranged between 96 and 52 a minute. Although this was the longest anesthesia in the series, the patient's blood pressure and pulse rate were stabilized for all but twenty-five minutes of the time. She received 6,500 cc. blood; 3,000 cc. dextrose in distilled water; and 1,000 cc. dextrose in saline, for a total of 10,500 cc. fluid.

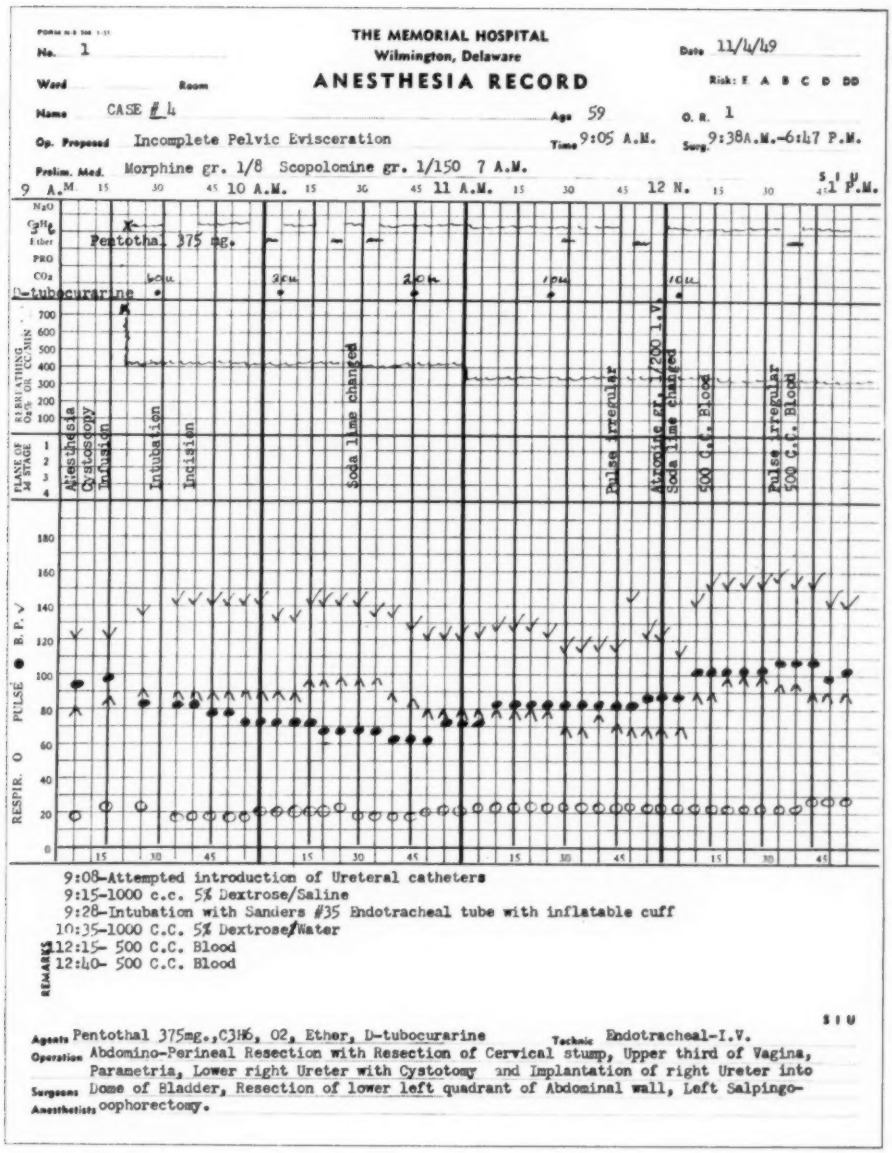
At the termination of the operation the blood pressure was 104 mm. Hg systolic and 70 mm. Hg diastolic; pulse rate was 72 a minute; respiratory rate was 28 a minute. This patient had a satisfactory recovery.

CASE 4.—A woman, aged 59, had a diagnosis of residual and recurrent carcinoma of the sigmoid colon and abdominal wall. Many years ago she underwent hysterectomy and right salpingo-oophorectomy, and the previous year she was operated on for carcinoma of the rectosigmoid, which was resected and anastomosed. The contemplated operation was *en bloc* abdominoperineal resection with resection of the cervical stump, upper third of the vagina, parametria, lower right ureter with cystotomy and implantation of right ureter into dome of the bladder, resection of lower left quadrant of abdominal wall, and removal of left tube and ovary.

Preoperatively, the blood pressure was 120 mm. Hg systolic and 80 mm. Hg diastolic; pulse rate was 92 a minute; respiratory rate was 18 a minute.

Preoperative medication consisted of morphine, gr. 1/8, and scopolamine, gr. 1/150. The anesthesia began at 9:05 a.m. and ended at 6:47 p.m. Anesthesia was induced with pentothal sodium, 375 mg., and was maintained with cyclopropane, oxygen, and ether, with *d*-tubocurarine chloride for relaxation. During this nine hour and forty-two minute anesthesia 24 mg. *d*-tubocurarine chloride and 1 mg. syncurine were used. For two hours and twenty minutes the blood pressure, pulse, and respirations were imperceptible (see chart). With a stethoscope placed over the cardiac region an apical rate was obtained of from 112 to 76 a minute, the only sign of life. Both blood and oxygen were administered under positive pressure. She received 8,000 cc. blood; 2,100 cc. plasma; 2,000 cc. dextrose in distilled water; and 2,000 cc. dextrose in saline, for a total of 14,100 cc. of fluid.

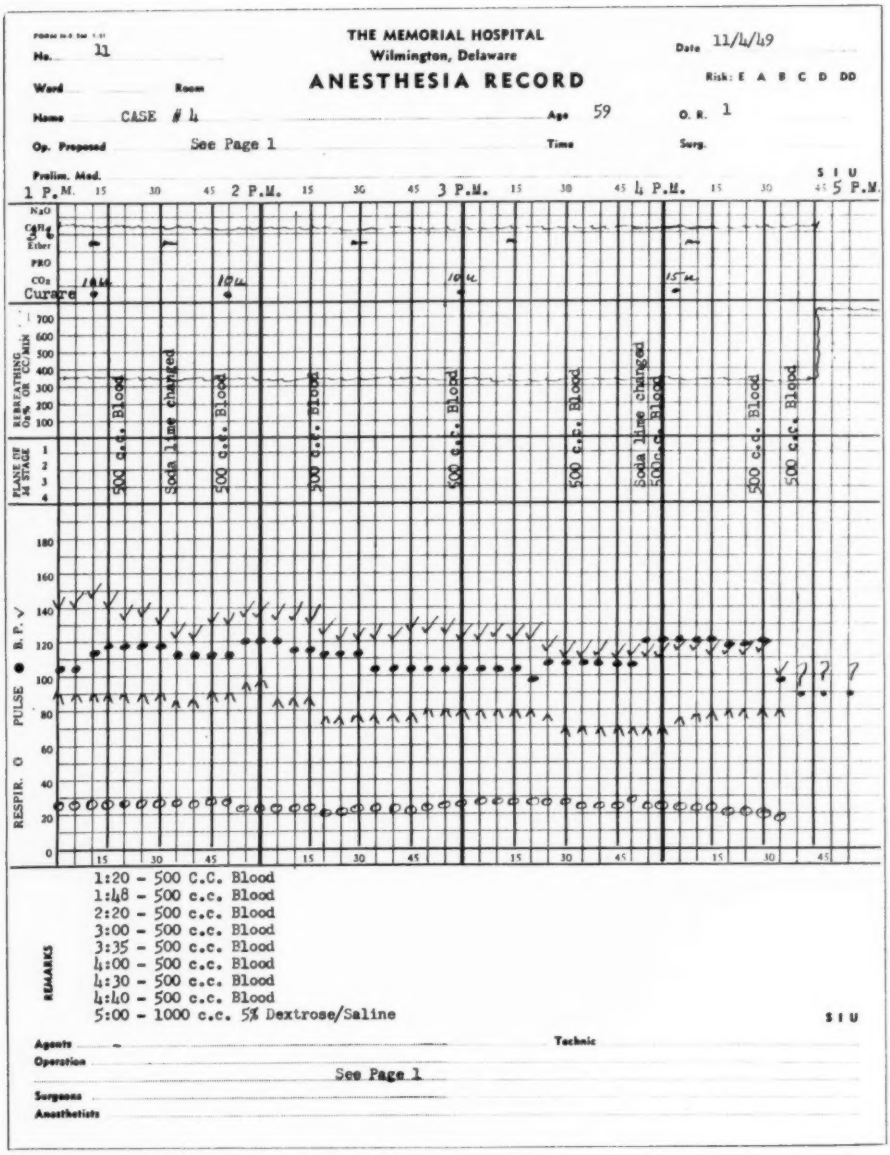
At the conclusion of the operation the blood pressure was 60 mm. Hg systolic and 30 mm. Hg diastolic. She was kept on the operating table until 9 p.m., when she was returned to her room. At that time the blood pressure was 90 mm. Hg systolic and 70 mm. Hg diastolic; pulse rate was 116



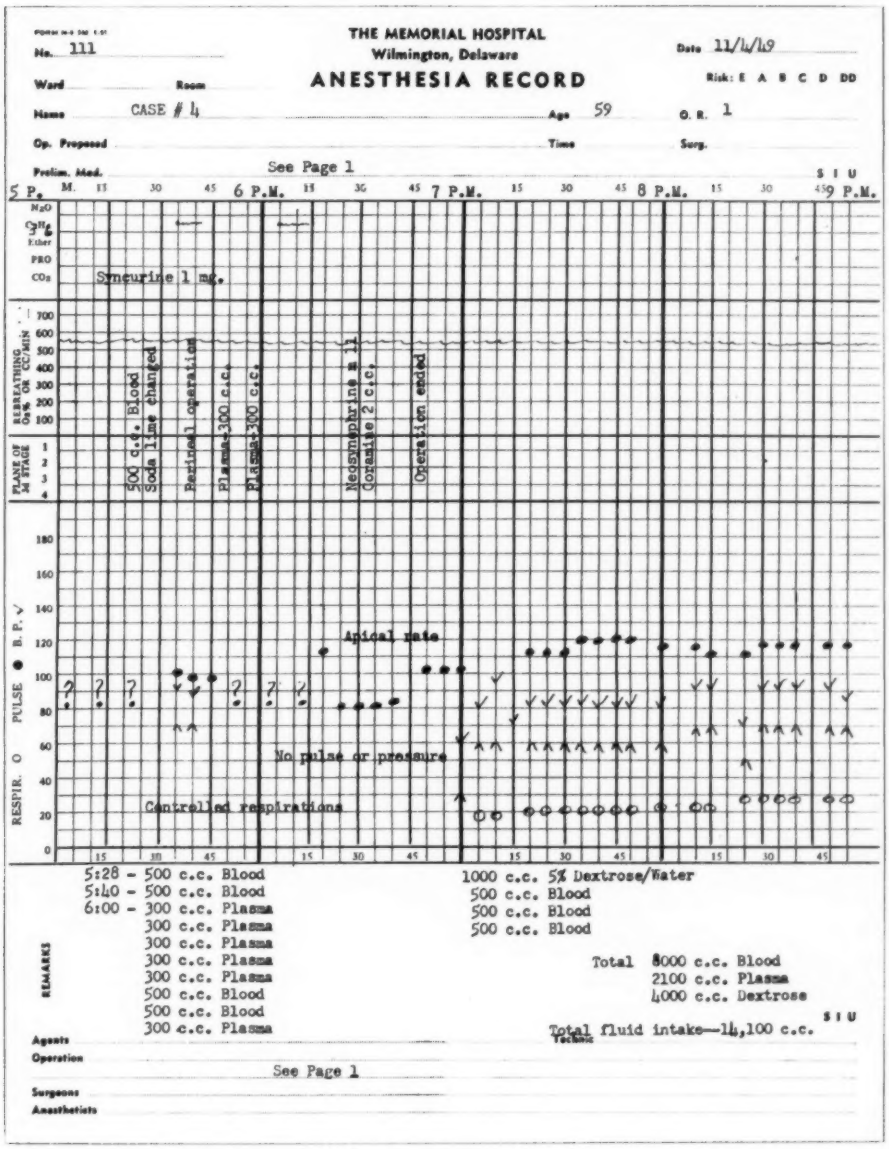
a minute; respiratory rate was 28 a minute. This patient had a satisfactory recovery.

Summary

I have been unable to obtain statistics on the actual duration of operations for pelvic evisceration in other hospitals and the management of the anesthesia, but the four cases reported represent the magnitude of the surgical and anesthetic problems in our ex-



perience at the Memorial Hospital. By the use of massive blood transfusions under positive pressure we have been able to bring



THE MEMORIAL HOSPITAL
Wilmington, Delaware
ANESTHESIA RECORD

No. 111 Date 11/4/49
Ward Room Risk: E A B C D DD
Name CASE # 4 Age 59 O. R. 1
Op. Proposed Time Surg.
Prelim. Med. See Page 1

5 P.M. 6 P.M. 7 P.M. 8 P.M. 9 P.M.

Syncurine 1 mg.
500 c.c. Blood
Soda lime changed
Rectosol operation
Plasma-300 c.c.
Plasma-300 c.c.
Neosynephrine # 11
Coramine 2 c.c.
Operation ended
Apical rate
No pulse or pressure
Controlled respirations

5:28 - 500 c.c. Blood
5:40 - 500 c.c. Blood
6:00 - 300 c.c. Plasma
300 c.c. Plasma
300 c.c. Plasma
300 c.c. Plasma
300 c.c. Plasma
500 c.c. Blood
500 c.c. Blood
300 c.c. Plasma

1000 c.c. 5% Dextrose/Water
500 c.c. Blood
500 c.c. Blood
500 c.c. Blood

Total 6000 c.c. Blood
2100 c.c. Plasma
4000 c.c. Dextrose

Total fluid intake—14,100 c.c.

REMARKS
Agents
Operation
See Page 1
Surgeons
Anesthetists

these lengthy radical procedures to a satisfactory conclusion.—

SUSAN CANNEY PRINCE, R.N., Memorial Hospital, Wilmington, Del.

Legislation

New York Bill Would Require Resident Anesthetist to be Eligible for Blue Cross and Blue Shield Payments.—A bill introduced by Senator Panken (S. Int. No. 1192, Pr. No. S. 1229) into the New York Senate would require hospitals to have a resident anesthetist at all times. Otherwise the hospital would be ineligible to receive payment for hospital care or medical expense indemnity from nonprofit service corporations.

This bill shows a lack of understanding of hospital administration. At the present time there are only a few hundred medical anesthetists who have been certified by the American Board of Anesthesiology. That number is certainly inadequate to staff thousands of hospitals throughout the country. There are some thousands of nurse anesthetists who are engaged in the administration of anesthesia in hospitals, and they too are insufficient in number to satisfy the needs of hospitals.

In the light of this shortage, it would be impossible for every hospital in New York State to have a resident anesthetist at all time. Furthermore, the anesthetist is necessary only when operations are scheduled. In practice hospitals schedule operations during certain hours of the day, and the services of the anesthetist would be required primarily through that period.

Moreover, throughout the State there are many small hospitals that have no need for a full-time anesthetist, assuming one were available in the community. It would be impossible for them to employ resident anesthetists either on a full-time or part-time basis. Sometimes the anesthesia must be administered by a member of the surgical staff who cannot be a resident at the hospital.

If such a law were to go into effect as is proposed by the bill, many of the hospitals that do not have a resident anesthetist would have to turn away patients, thus throwing a terrific load on other hospitals. Hospital care and medical indemnity insurance is so widespread throughout the State that it would be inconceivable to deprive the public and subscribers of the services of hospitals that do not have resident anesthetists.

The only effect that such a law could have would be to disrupt the present operation of hospitals and deprive the public of the services of all hospitals.

Hospitals throughout the state wrote to the Legislature protesting against the proposed law, with the result that the bill died in committee.

Liability for Injury to Therapy Technician for Oxygen Explosion.[1] — An oxygen therapy technician employed in a hospital was injured by an explosion through the valve attached to the

(Continued on page 143)

1. Liberatore v. National Cylinder Gas Company, Inc., 20 CCH Neg. Cases 179—U.S.C.A. 2nd, N. Y.

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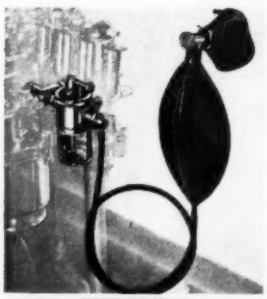

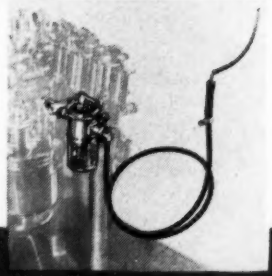

NON-REBREATHING TECHNIQUES

The Trimar vaporizer connected to a 2-way valve mounted on a stand model Heidbrink Kinet-o-meter. The vaporizer supplies gas through a 3-liter collector bag. Gas then goes through the inlet of a non-rebreathing Slater-Stephen type of valve into a standard Ohio mask of any size.

A similar assembly employs an intratracheal catheter in place of the face mask. A short length of large bore tubing connects the non-rebreathing valve to a curved Magill catheter connector which is in turn attached to a standard intratracheal catheter.

PARTIAL REBREATHING TECHNIQUE

The collector bag is eliminated and in its place a T-connector with a side arm is installed, connected by a short length of large bore rubber tubing to the catheter connector. This assembly provides for Ayres' technique, and the amount of rebreathing is controlled by changing the length of this rubber tubing.

OHIO CHEMICAL & SURGICAL EQUIPMENT CO.

Ohio Chemical

Abstracts

COLE, FRANK: Use of human serum albumin in cerebral edema following cardiac arrest. Report of a case. J.A.M.A. 147: 1563-1564, Dec. 15, 1951.

"Human serum albumin was first used to combat postanesthetic encephalopathy by Seldon and associates. However, in the two cases they described, there was no cardiac arrest. In the case presented here, human serum albumin was administered in a postasystolic syndrome. . . . At 7:40 a.m. on June 21, 1950, a tetracaine-procaine spinal anesthetic was administered to a 21-year-old white man, by his surgeon, for right inguinal hernioplasty. The injection was made at the second lumbar interspace after administration of 50 mg. of ephedrine. Six minutes later the level of anesthesia was at the umbilicus; the head was then raised. During the next 30 minutes the blood pressure fell progressively, but not too precipitantly. Carbon dioxide and oxygen were given for nausea and perhaps shallow respirations. By 8:20 a.m. the blood pressure was 100/60. Two minutes later the patient became both apneic and pulseless. The head was lowered, and after several minutes oxygen was administered under pressure. The patient was cyanotic; his pupils were widely dilated. His color improved after one minute, but, although 1 cc. of epinephrine hydrochloride and 1 cc. of pentamethylenetetrazol . . . were administered intravenously, the heart remained flaccid. A midline subensiform incision was made, and the heart was massaged for three minutes. Finally, 1 cc. of epinephrine was injected into the heart. Two minutes later the first feeble heart beat was noted. The contractions gradually became stronger and regular in rhythm and volume. At 8:35 a.m. the patient drew his first voluntary breath since the appearance of cardiac arrest. Within five minutes respiration was deep and apparently normal, and the operation was resumed.

"At 9:20 a.m. both incisions were closed. The patient was placed on a cart, where he immediately became spastic. The spasticity became severer; the breathing was stertorous. Pink, frothy pulmonary secretions appeared, which were aspirated. Generalized spasm appeared, then rigidity and convulsions. The convulsions continued until noon, being stopped three times by intravenous administration of thiopental (pentothal) sodium. The patient continued to have a considerable amount of mucus. I first saw the patient at 12 noon, while he was still unconscious and in convulsions. The respiratory rate was 40, the pulse rate 132, and the blood pressure good. The color was fairly good while he was receiving oxygen; without it, he was cyanotic. He was given 5 cc. of thiopental sodium and 50 cc. of 50% glucose intravenously. The convulsions stopped, and the rigidity gradually declined. At 12:30 p.m. his

rectal temperature was 105.2 F. and blood pressure 140/85. . . . Oxygen under pressure of 4 mm. Hg was administered to combat the pulmonary edema; the inhaling breathing tube was surrounded by cracked ice. . . . At 1:30 p.m. 100 cc. of human serum albumin (containing 25 gm. of albumin) was administered intravenously. At 2 p.m. the patient opened his eyes and appeared to swallow. . . . At 3 p.m. 100 cc. of human serum albumin was again given intravenously. . . . At 6 a.m. the next day he phonated loudly but did not speak. He grimaced frequently and resisted being moved. A dose of 100 cc. of human serum albumin was injected intravenously. Now good color could be maintained without oxygen. On the third day he was able to hear and see and to recognize people. . . . On July 15 he was still continuing to improve. He conversed well and spoke of his studies, which he was eager to resume. The only change apparent to a friend who had known him well before his operation was that he was somewhat less vivacious than before. His memory for events immediately preceding the operation was imperfect but improving. A few days before he had thought he had done twice what he had really done only once and had thought that two persons had visited him when only one had been there; this phenomenon soon disappeared, and it was felt that his recovery was complete."

Morton, H. J. V., and Wylie, W. D.: Anaesthetic deaths due to regurgitation or vomiting. Anaesthesia 6:190-201; 205, Oct. 1951.

"Eighteen months ago the Association of Anaesthetists set up a committee to investigate deaths associated with anaesthesia. As members of this committee we have studied details of forty-three cases where death resulted from regurgitation or vomiting. In many of the reports there was evidence of inexperience on the part of the anaesthetist, inasmuch as precautionary measures were either inadequate, or had not been taken. . . . For trouble to occur there must be: (1) Material in the stomach or oesophagus. (2) Something to cause the material to come out. (3) Facilities for the regurgitated or vomited material to come in contact with the air passages. Conditions under which material may be present in the oesophagus or stomach [are]: Material in the oesophagus. . . . Material introduced into the stomach from above. . . . Material introduced into stomach from below. . . . Material from stomach itself. . . . Prolonged emptying time of stomach. . . .

"What causes the material to come out of the oesophagus or stomach? [1] Vomiting [and 2] regurgitation. . . . [The mechanism of death may be]: Anoxia due to respiratory obstruction by an overwhelming quantity of material, anoxia due in the first place to laryngeal spasm . . . reflex effects on the heart . . . or late effects [such as] aspiration, bronchopneumonia, atelectasis, and lung abscess. . . . If it is found that food has been taken, nonurgent operations for which a general anaesthetic is required should be postponed. . . . If an immediate general anaesthetic is imperative, the anaesthetist must wash out and empty the stomach through an oesophageal tube. Although food or drink has not

been taken recently, it is unlikely that the stomach is empty. . . . Experience has shown . . . that there are occasions when the stomach must be emptied, or demonstrated to be empty, before any general anaesthetic is given. These can be classified as follows: I. All 'acute abdominal conditions'. . . . II. All operations on the stomach (including Ramstedt's operation). III. Cases in which it is intended to use a relaxant or very deep anaesthesia, before a cuffed endotracheal tube has been passed. . . . IV. Oesophageal obstruction. . . . In the majority of cases reported to the committee the regurgitated material was liquid. . . . Liquids can be removed from the stomach by means of Ryle's or oesophageal tubes. . . . When there is a diagnosis of intestinal obstruction. . . or the appearance of the stomach contents, in any case, suggests ileus, or considerable manipulation of the stomach itself is expected (e.g. partial gastrectomy, or suture of perforated ulcer), it is then the anaesthetist's duty to obtain safe and satisfactory conditions for the insertion of a cuffed endotracheal tube. For this purpose we consider that the beginner, after making every effort to empty the stomach, should use a nitrous oxide-oxygen-ether sequence, giving carbon dioxide, if required, to facilitate the introduction of the ether. . . . At the end of operation, the stomach should be reemptied and the return of the protective reflexes awaited before a cuffed tube is removed, and before the patient leaves the operating room. Moreover, as an added precaution, the patient should be placed on his side. . . .

"It seems probable that in a 'normal' person, who has eaten a 'normal' meal, the stomach empties in anything from three to four-and-a-half hours. It is therefore unwise to induce anaesthesia less than five hours after a meal. Nor must it be forgotten, especially when dealing with out-patients, that the emptying time may be prolonged if an accident occurs to an otherwise normal person. Children need particular care, inasmuch as they cannot be expected to co-operate, neither is it always possible to obtain a reliable history. . . . It is rare for thiopentone to initiate vomiting, but the rapid relaxation produced by this drug favours regurgitation, which is followed by laryngeal spasm. . . . It is foolhardy merely to rely on dexterity at intubation. When an injection of thiopentone and relaxant is given to a patient in the horizontal position, regurgitation can occur befor the anaesthetist has time to put a laryngoscope into the mouth. . . . Cases occur where a general anaesthetic is given, without the possibility of regurgitation or vomiting having been considered. Induction may be accomplished without incident. But when the abdomen is opened a distended stomach, or evidence of intestinal obstruction is found. In these circumstances it is obligatory for the surgeon to wait, and to desist from making intra-abdominal manipulations, until the anaesthetist has changed to a safe technique. . . . The patient should be tilted into a foot-down position without delay, and a cuffed endotracheal tube introduced and joined directly to the apparatus. It is then usually easy to pass a well-greased 12 gauge oesopha-

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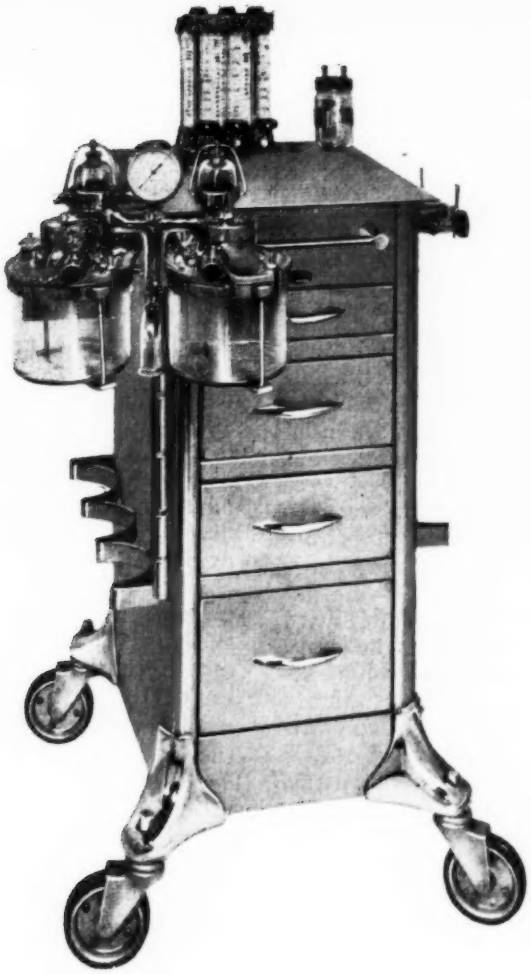
Thoughts While Holding Up a Chin—A few seconds spent in checking the apparatus before starting a case, may avoid embarrassing situations during the operation.

geal tube and deflate the stomach . . . . There are occasions when the occurrence of regurgitation or vomiting during induction necessitates the postponement of the proposed operation. . . . It must not be assumed that, because some material has been vomited, the stomach is then necessarily empty. . . . If immediate operation is essential, the anaesthetist must wait until the patient is sufficiently conscious to co-operate. An oesophageal tube can then be passed and the stomach completely emptied. On no account should relaxation be produced by deepening the anaesthesia, or giving a muscle relaxant. Neither is it advisable to attempt to pass an oesophageal tube under light anaesthesia alone. This manoeuvre is sometimes impossible, and if manipulations are continued, vomiting will undoubtedly occur before consciousness is regained. . . . If a patient comes to the theatre having failed to swallow or 'tolerate' a Ryle's tube, the anaesthetist himself should pass a No. 12 oesophageal tube. . . . Several reports have emphasised the danger of relying upon an uncuffed endotracheal tube, without also a wide bore tube into the stomach. . . . Using a pharyngeal pack in conjunction with an uncuffed endotracheal tube is not a safe technique. The pack may become dislodged. . . .

"We have notes of four diabetic cases where glucose solution was given preoperatively, as is customary, and subsequent regurgitation or vomiting of fluid brought about the death of the patient. . . . Water passes rapidly into the duodenum, but hypertonic glucose solution prolongs the emptying time of the stomach. . . . We recommend that the practice of giving glucose solution by mouth be discontinued. . . . If regurgitation or vomiting has occurred, the obstructing material must be aspirated, and oxygen administered. The immediate treatment—the turning of the patient on his side, the head-down position, the use of the mouth gag, tongue clip, swabs and sucker—these aspects are well known and require no elaboration. We would urge, however, that before suspected cases are anaesthetised the suction apparatus be tested, and brought to hand. . . . As long as the pharynx is completely full, the sucker will have to be used before oxygen can be effectively given. But once the pharynx has been cleared a mask should be held on and oxygen given through it. An airway can be used if the jaw is sufficiently loose. Usually the larynx is in spasm, in which case a positive pressure of about 15 cm. of water should be applied, so that oxygen is forced down the moment the larynx begins to open. We consider it most unwise to attempt to intubate the larynx at this stage. If there is any opening, oxygen will pass through. If the larynx is closed any form of instrumentation will only aggravate the spasm, especially if the patient is anaesthetised with thiopentone. Laryngeal spasm will pass if a relaxant is given. Unfortunately, the latter may facilitate further and perhaps more copious regurgitation. . . . When it is certain, or thought highly probable, that material has been inhaled, the question of immediate bronchoscopy arises. For a patient in poor general condition, already suffering from acute oxygen lack, this procedure may be lethal."



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COHEN, E. N., AND BEECHER, H. K.: Narcotics in preanesthetic medication. A controlled study. J.A.M.A. 147:1664-1668, Dec. 22, 1951.

"This paper presents evidence . . . which indicates that a narcotic is not essential in preanesthetic medication and that the attainable function of a narcotic in preanesthetic medication can be adequately performed by a barbiturate with fewer undesirable side-effects. . . . Hospital patients were used as subjects, and they were divided into three equal groups to include approximately the same number of major and minor surgical procedures in comparable patients. The 558 subjects were drawn in rotation from the daily schedule of operations. No attempt was made to select patients for the experiment except to eliminate the extremes of age and weight and to exclude patients with known contraindications to the drugs used. All anesthetics were administered by the anesthesia house staff which included both physicians and nurses in various degrees of training, all under close supervision, and without knowledge of what the premedication solution contained. Three premedication solutions were prepared so that each 2 cc. volume contained: (1) 15 mg. of morphine sulfate and 0.6 mg. of atropine sulfate, or (2) 90 mg. of pentobarbital sodium and 0.6 mg. of atropine sulfate, or (3) 0.6 mg. of atropine sulfate. A standard vehicle containing 8% ethyl alcohol, 70% propylene glycol, and water sufficient to make 100 cc. was used for premedication solutions, which were administered subcutaneously on the basis of 2 cc. of solution per 70 kilograms of body weight. The contents of all solutions were unknown to the patient, floor nurse, anesthetist, and examiner. . . .

"The 558 cases studied were divided as follows: Nitrous oxide and ether, 353; cyclopropane, 100; thiopental sodium (pentothal sodium) alone and with nitrous oxide, 105. . . . The anesthetists were asked to evaluate the overall adequacy of the premedication used and to express an opinion as to whether or not they thought a narcotic had been present in a given case. This last opinion was expressed independently of the characteristic eye signs of morphine medication. The errors of the guesses . . . are such as to indicate that the anesthetists followed the instructions. The data . . . also suggest that the anesthetists were satisfied almost equally with all premedication solutions used, including atropine alone. . . . After receiving a premedication solution, the patient was evaluated in his preanesthetic stage according to the following three categories. First, objective physical findings were recorded from examination of the patient: respiratory rate, pulse rate, and blood pressure. Second, a series of simple direct questions was asked the patient . . . to which he responded 'yes' or 'no.' Third, the anesthetist recorded his impressions as to any apprehension, excitement, or euphoria manifested by the patient during his preparation for induction, regardless of his response to direct questioning. . . . It appeared that the patient himself thought that morphine was slightly more effective (6%), in comparison with atropine alone, for reducing the

amount of preoperative excitement and also for producing a sleepy state preanesthetically. . . . There appears to be little difference in the power of the premedicating solutions used to prepare the patient for his anesthetic experience, judging by his recall. . . . Smoothness of induction of anesthesia, muscular relaxation as measured by the time for insertion of an endotracheal tube, depth of anesthesia as indicated by venous blood levels of cyclopropane and of ether, and observations of milligrams of thiopental sodium required per minute all show no important and few significant differences with the three premedicating solutions tested.

"Blood oxygen saturation and carbon dioxide elimination were satisfactory, in the cases studied. On principle, it is desirable to reduce the use of narcotics whenever possible. As a further principle, morphine and similar agents should not be used because of their power to produce euphoria, except in conjunction with the treatment of severe pain or in patients who are dying, as with terminal cancer. Unless pain is present, there is no need for a narcotic in preanesthetic medication. Its function can be adequately fulfilled by a small dose (90 mg.) of pentobarbital sodium. The later agent has fewer hazards associated with it than have the commonly used narcotics."

LEGISLATION

(Continued from page 130)

top of a metal cylinder containing oxygen under 2,200 pounds pressure. The explosion occurred when, after connecting the cylinder for use in the usual manner, he started to release the valve to administer oxygen to a patient, and so injured his left hand that the middle finger had to be amputated. He sued the company, a processor of medical oxygen and the supplier of the cylinder here involved, to recover damages.

The theory to support the lawsuit was that the company had failed to tighten a packing nut which, consequently, did not properly hold the valve in place. The defense was that the explosion was not so caused but was caused by the presence of some foreign substance in the valve, for which the company was not shown to be responsible, which caused friction when the oxygen was released. It was also claimed that the technician was guilty of contributory negligence in that he did not employ a precautionary technic sometimes used for blowing out any foreign substance that may have entered the valve.

A verdict for damages was rendered by the jury in favor of the technician. The court said the evidence tended to show that the explosion was caused by a failure to guard against the blowing of the valve by securely tightening the packing nut. The installation had been undertaken by the company, and it was reasonable for the jury to find it had been negligently performed. The failure of the technician to employ the technic for clearing the valve was not contributory negligence as a matter of law. This question was also submitted to the jury, which found that he had not been contributorily negligent. The judgment in favor of the technician was affirmed. — **Emanuel Hayt, LL.B.**, Counsel for A.A.N.A.

Book Reviews

Observations on the General Effects of Injury in Man with Special Reference to Wound Shock. By R. T. Grant and E. B. Reeve. Paper. 313 pages, 19 illustrations. London: His Majesty's Stationery Office, 1951.

This book will be of particular interest to anesthetists although but a small part of the text pertains to anesthesia per se. The detailed study of many wounded persons, with special emphasis on circulatory features of injury, contains a wealth of valuable information that could be applied not only during day-to-day operative procedures but also particularly to the care of victims of trauma.

Major R. P. Harbord was in large part responsible for clinical observations relating to anesthesia.

The book is not indexed. However, a detailed table of contents makes reference easy.

A Textbook of Pharmacology and Therapeutics. By Harold N. Wright, M.S., Ph.D., Professor of Pharmacology, University of Minnesota, and Mildred Montag, Ed.D., R.N., Assistant Professor of Nursing Education, Teachers College, Columbia University. Ed. 5. Cloth. 620 pages, 76 illustrations. Philadelphia: W. B. Saunders Co., 1951.

The fifth edition of this well known text has been brought up to date to include advances that have been made in this field during the three years since publication of the previous edition.

Although nurse anesthetists may confine their interests to certain chapters, such as those dealing with drugs that affect the central nervous system, they may find that a general review of the whole book will be useful.

Drugs and Solutions. By Harold N. Wright, M.S., Ph.D., Professor of Pharmacology, University of Minnesota, and Mildred Montag, Ed.D., R.N., Assistant Professor of Nursing Education, Teachers College, Columbia University. Paper. 91 pages, 17 illustrations. Philadelphia: W. B. Saunders Co., 1952.

This workbook is a companion to *A Textbook of Pharmacology and Therapeutics* by the same authors. To nurse anesthetists it will serve as an excellent review of the fundamentals necessary to the preparation and administration of drugs. The information can readily be adapted to the peculiar needs of persons handling only certain types of drugs.

CORRECTION

In the advertisement for an anesthetist at the Harper Hospital, Detroit, the salary as published in the February JOURNAL was incorrect. The salary offered was $4228 instead of $4428.

Classified Advertisements

ANESTHETIST: Fourth anesthetist for 100 bed hospital. $300 a month with partial maintenance. Work unusually light. Apply: Mrs. Probandt, Belmont Community Hospital, 4058 W. Melrose, Chicago, Ill.

WANTED: Nurse anesthetist. Fully approved general hospital of 300 beds. Salary open. Apply: Dr. Ralph E. Schopfer, Anesthesiologist, The Williamsport Hospital, Williamsport, Pa.

WANTED: Nurse anesthetist, Association member or examination eligible preferred. 500 bed teaching hospital. Presently on forty-eight hour week; starting salary $4,323.20 per year. Maintenance available at $980. Periodic salary increases every eighteen (18) months. Twenty-five (25) days paid leave and fifteen (15) days paid sick leave per year. Medical anesthesiologist in charge. University of Virginia Hospital, Charlottesville, Va.

WANTED: Nurse anesthetist. Two hundred bed hospital approved AMA-ACS. Full time anesthesiologist. Opportunity for advanced teaching. Forty hour week. Beginning salary $325. Complete maintenance if desired. One hour thirty minutes from New York City. Apply Box D-70, Journal A.A.-N.A., 116 S. Michigan, Chicago 3, Ill.

WANTED: Nurse anesthetist for clinic in midwestern city. Congenial and capable surgical staff. Salary open. Box D-50, Journal A.A.N.A., 116 S. Michigan Ave., Chicago 3, Ill.

NURSE ANESTHETIST for approved 83 bed hospital expanding to 113 beds. Vacation, sick leave, Social Security available. Excellent location near Chicago. Apply to: Director of Personnel, Highland Park Hospital, Highland Park, Ill.

WANTED IMMEDIATELY: NURSE ANESTHETISTS for 700 bed general hospital. Pleasant working conditions. Salary open. Complete maintenance. Liberal employee benefits. Apply: Personnel Director, Grady Memorial Hospital, 36 Butler St., S. E., Atlanta, Ga.

WANTED: Nurse anesthetist for 200 bed hospital. Hospital well located. Excellent nurses home. Pleasant surroundings and modern set-up. Room, laundry, and meals. Within one-half hour by motor and transportation from Virginia's delightful beaches. Excellent position for right party. State particulars and salary expected. Address: Administrator, The King's Daughters' Hospital, Portsmouth, Va.

POSITION AVAILABLE—NURSE ANESTHETIST: ABINGTON MEMORIAL HOSPITAL, ABINGTON, PA. APPLY: DIRECTOR, DEPARTMENT OF ANESTHESIOLOGY.

OBSTETRIC ANESTHETISTS: Immediate openings in 373 bed, fully approved general hospital. Completing plans for 200 bed expansion Large active obstetric service—excellent equipment—40 hour week—vacation and sick leave policies—salary open. Apply: Personnel Director, Aultman Hospital, Canton, Ohio.

ANESTHETISTS (NURSE): Two vacancies: A.A.N.A. member. 626 bed general hospital. Ten nurse anesthetists on staff. Good salary and hours. Liberal personnel policy. Apply: Chief Anesthetist, Good Samaritan Hospital, Cincinnati 20, Ohio.

ANESTHETISTS WANTED: Busy suburban hospital near Chicago. New nurses' residence. (Apartments available for married anesthetists.) Starting salary $315 per month and complete maintenance, which is equivalent to $415. Vacation, sick leave, Blue Cross Insurance, and free life insurance. Apply: Box E-20, Journal A.A.N.A., 116 S. Michigan Ave., Chicago 3, Ill.

MOVING TO PHILADELPHIA? Suburban general hospital, 130 beds, needs a nurse anesthetist in addition to present staff of three. Write: Administrator, Chestnut Hill Hospital, 8835 Germantown Ave., Philadelphia 18, Pa.

NURSE ANESTHETIST WANTED for dental surgeon's office. Dr. Krasner, Verona, N. J. Ve. 8-1713.

NURSE ANESTHETIST: 150 bed general hospital. Limited rotating call until 7 p.m. Salary $350 per month. Vacation and sick leave. Apply: Superintendent, Garfield Park Community Hospital, 3821 W. Washington Blvd., Chicago 24, Ill.

TWO NURSE ANESTHETISTS: For 125 bed general hospital. Salary open. Full maintenance. Apply to: Superintendent, Maine Eye and Ear Infirmary, Portland, Me.

NURSE ANESTHETISTS for 300 bed approved general hospital in east Tennessee. $350 per month plus complete maintenance. Apply: Box E-40, Journal A.A.N.A. 116 S. Michigan Ave., Chicago 3, Ill.

ANESTHETIST: 60 bed general hospital in southeastern Wisconsin. Short distance from Milwaukee and Chicago. Salary open. Inquire: Administrator, Memorial Hospital, Burlington, Wis.

NURSE ANESTHETIST (A.A.N.A. member): 300 bed hospital. Work with anesthesiologist. Salary open. Apply to: Chief of Anesthesia Department, St. Francis Hospital, Trenton 9, N. J.

NURSE ANESTHETIST for 250 bed hospital, well equipped and fully approved, predominantly surgery. Top salary, meals and laundry furnished, good hours, sick leave, vacation and holidays. Apply: Administrator, Mid State Baptist Hospital, Nashville, Tenn.

NURSE ANESTHETIST position available in 435 bed hospital. $350 starting salary; two weeks' vacation with pay; 40 hour week; no Sundays on call. Write: Seymour Brown, M.D., Director, Department of Anesthesiology, St. John's Hospital, St. Louis 10, Mo.

ANESTHETIST, NURSE: To be one of four, 106 bed general hospital, $300 month plus maintenance. Middlesex General Hospital, New Brunswick, N.J.

WANTED: Nurse anesthetists. Several vacancies. Starting salary $325-$375; 44 hour week. Full maintenance optional. Vacation, sick leave, hospitalization, etc., allowed. 500 bed general hospital. Apply: W. S. Kohlhaas, Superintendent, Harrisburg Hospital, Harrisburg, Pa.

NURSE ANESTHETISTS: Michael Reese Hospital, largest private hospital in Chicago, has openings for nurse anesthetists in connection with expanding program. Opportunity for excellent experience working with nationally known physicians is offered to qualified, interested nurses. Salary: $400 per month; 40 hour week, overtime after 40 hours. Excellent working conditions: maintenance available at low cost, many benefits. Write: Personnel Director, Michael Reese Hospital, Chicago 16, Ill.

WANTED: Two nurse anesthetists immediately. South. Salary $350 with room. Write: Box E-50, Journal A.A.-N.A., 116 S. Michigan Ave., Chicago 3, Ill.

UNIVERSITY HOSPITALS OF CLEVELAND SCHOOL OF ANESTHESIA: Pin has been adopted. Order through school, 2065 Adelbert Rd., Cleveland 6, Ohio.

NURSE ANESTHETISTS (2): A.-A.N.A. membership required. Salary $360 per month, plus meals, private room and bath in new women's residence, and laundry. Social Security and private pension plan. Apply: Administrator, The Reading Hospital, Reading, Pa.

NURSE ANESTHETIST (A.A.N.A. member preferred): To increase staff to three anesthetists. New addition and new O. R. suite opening soon. Closed staff, five surgeons. ACS, AMA approved. Intratracheal experience necessary. Salary open; maintenance available. Contact: Miss Dorothy Finley, Chief Anesthetist, Holzer Hospital, Gallipolis, Ohio.

NURSE ANESTHETISTS (A.A.N.-A. members): Immediate openings available. Permanent. 40 hour week with paid overtime. Extra pay for night duty. Automatic pay increases. Complete staff 16 nurse anesthetists. Only emergency operations on Saturdays. Living accommodations available. Apply: Director Anesthesia, Harper Hospital, Detroit 1, Mich.

NURSE ANESTHETIST — To increase staff. Apply: Chief Anesthesia Department, The Mercer Hospital, Trenton, N. J.

WANTED: Anesthetist, nurse, A.A.-N.A. member, 80 bed general hospital, fully approved, call rotated. Supervision by anesthesiologist. Apply: Box E-30, Journal A.A.N.A., 116 S. Michigan Ave., Chicago 3, Ill.

TWO ANESTHETISTS: 240 bed hospital, maintenance optional. Good working conditions. Full time for holidays. Sick leave. Salary based on qualifications and experience. Apply to: Sister M. Annunciata J., Mercy Hospital, Portland, Me.

ANESTHETIST WANTED: Full time, 40 hour week for operating room. Beginning salary $400 per month, uniforms and laundry. Female preferred but would consider a male anesthetist. Advancement in salary at end of six months or a year, according to efficiency and reliability. General hospital, 225 bed. Surgical residency. P.O. Box 840, Battle Creek, Mich.

WANTED: NURSE ANESTHETIST for 350 bed hospital. All types of anesthesia administered. $300 per month plus maintenance. Apply: Anesthesiologists Associates, 152-11 89th Ave., Jamaica 2, N. Y.

NURSE ANESTHETIST: 300 bed hospital; immediate opening for a nurse anesthetist. Starting salary $350 per month, periodic raises. Write direct to: Personnel Director, Providence Hospital, Washington 3, D. C.

NURSE ANESTHETIST wanted to complete staff of four. 183 bed general hospital doing O.B. and surgical anesthesia in university city of 100,000. Salary $325 per month with full maintenance and uniforms furnished. One month paid vacation, six holidays, and accumulative sick leave with pay. Social security available. Off from Friday noon to Monday a.m. following weekend call when fully staffed. Apply to: Edgar Huse, Personnel Director, Lincoln General Hospital, Lincoln, Neb.

NURSE ANESTHETISTS for 340 bed A.M.A. and A.C.S. approved hospital. Department headed by physician anesthetist. Room available in nurses' residence. Mount Sinai Hospital, 2750 W. 15th Pl., Chicago, Ill.

NURSE ANESTHETIST: To work with anesthesiologist in 243 bed, approved general hospital. Twenty minutes from New York City. Liberal personnel policies. Salary open. Forty hour work week; four weeks' paid vacation. Full maintenance. Apply: Chief, Anesthesia Department, Elizabeth General Hospital, Elizabeth, N. J.

NURSE ANESTHETISTS for 150 bed community hospital. Four nurses, full time M.D., all agents and technics. Good opportunity for advanced training. Full maintenance and one month's vacation. Two and one-half hours from Boston and New York. Write G. J. Carroll, M.D., William W. Backus Hospital, Norwich, Conn.

NURSE ANESTHETIST skilled in administering all types of anesthesia to work in teaching department affiliated with Northwestern University. 40 hour week; 30 day vacation annually. Very little O. B. work. Apply: Personnel Office, Evanston Hospital, 2650 Ridge Ave., Evanston, Ill.

INDEX TO ADVERTISERS

a 22-minute review

▶ *The 22-minute film, "Physiology of Anoxia," outlines the physiological basis for the use of oxygen in the relief of anoxia. This visual review is suitable for medical students, refresher courses, and other medical groups.*

The motion picture illustrates: 1. Normal breathing. 2. Anoxia. 3. Oxygen transport. 4. Rationale of oxygen at increased concentrations in treating anoxia.*

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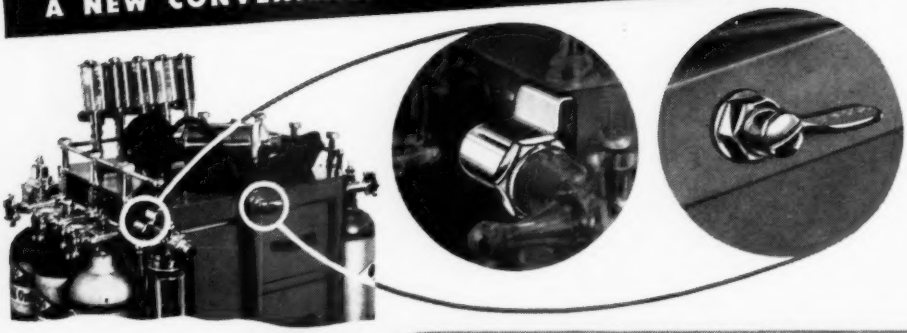

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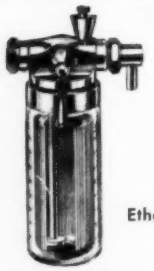

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Ether Vaporizer — Bubble Thru type. On Cabinet Kinet-o-meters, mounting bracket included in price of two-way valve. Attaches directly to stand and cart models by means of union nut connection. It becomes a permanent part of apparatus and does not have to be removed when circle method is used.

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